Workplace E-learning, does it Work?

A New Approach to Evaluating E-learning Courses with Implications for Design

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ABSTRACT

MASTER'S DEGREE IN EDUCATIONAL SCIENCES – MASTER'S THESIS

Title	Workplace E-learning, does it Work? A New Approach to Evaluating E-learning Courses with Implications for Design
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Abstract

Do e-learning courses work, and to what extent is the quality of e-courses being examined? From our understanding of current literature, most methods for evaluating e-courses are based on evaluation models that are not intended for e-learning at all. These models mainly evaluate how well a course worked by measuring user satisfaction, changes in behaviour and returns on investment. However, our findings indicate that organizations rarely evaluate properly, if at all. So then, how can we be sure that e-courses work?

We consider this problem to be "wicked," meaning that finding the answer is frustrating and maybe impossible. To suggest an answer, we created a prototype of a new evaluation model. The model means to evaluate e-courses based on how well they facilitate its users' achievement of learning goals. We named it the LGA (Learning Goal Achievement) Facilitation model.

The prototype was created using Design Based Research (DBR) methods. This involved developing a total of four iterations of our model, informed by feedback from members of its target group. We began by creating a draft based on theory, which was then refined into the first iteration of the model and sent to our participants. These participants provided feedback we then used to improve the model by designing new iterations. We ended up with a prototype that was refined three times, and is ready for pilot testing.

We found that our participants largely agreed with our approach, and expressed that it could improve practices within their fields. We also found that design guidelines fit into our model, as they could be based on the same principles as evaluation. Making our model as simple and short as possible was considered to make it attractive to use.

To know if the model works in practice it would need to be tested, and should be further improved based on test results. We would argue that our work is an example of how students can contribute to practices outside academia, as well as within, and how organizations could benefit from collaboration with students. This model prototype is an original contribution, and the responses we have received indicate a desire for such novelty within the field.

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I hope to spend many more years together, conducting further research.

Rebekka M. C. Walle

Oslo, June 2021

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Tobias Mæland Tungland

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1. Introduction

In this thesis we created a prototype for a new model of evaluating and designing e-learning courses (and not e-learning as a wider phenomena.) As workplaces continue to digitalize their practices, including their methods of training and competence development, many seem to view e-courses as time- and cost-efficient tools (Van der Wardt, 2014). E-courses and the importance of their quality seems especially relevant in the wake of the COVID-19 pandemic, which has forced many workplaces to have their employees work remotely from home. Remote digital learning implementations like e-courses are convenient and appropriate for independent and remote work, and there is little to indicate that the use of e-courses will decrease in the near future. However, there is little apparent consensus regarding whether or not they generally work, and most established evaluation models are not addressed for e-learning specifically. This poses a dilemma relevant for anyone using, purchasing, commissioning or designing e-courses; "why use e-courses if we don't know if they work?" We suggest this question may then be followed or even replaced by another; "how do we find out if they do?" Evaluation of e-courses' quality, and their use for training purposes in workplaces, thereby seems highly relevant. Its relevance was further made apparent during our research.

To answer the research questions we specify later in this chapter, we made our own evaluation model prototype through iterative design. This involved continuous refinement and redesigning of the model, based on feedback from expert participants. We called our model the LGA (Learning Goal Achievement) Facilitation model. It is designed to evaluate the pedagogical soundness of e-courses, by looking at how well the e-course facilitates the user's achievement of relevant learning goals.

Our participants possessed relevant and complementary competences from various fields, and provided rich data when evaluating our designs. During our data collection, the participants made us aware of our model's implications for design. The pedagogical principles of our model could serve as a foundation of both evaluation and design guidance. Hence, the iterative refinement of the model led us to include design guidelines in the prototype. This additional focus and purpose of our model was not intended when we first made our problem statement, or began its development. We will explain how this came to be as we present our process of research and design.

In this introduction we will describe our working definition of e-courses and summarize some of the previous work done within the field of workplace learning evaluation. This is intended to provide context to the presentation of our problem statements, which will be followed by a brief disposition of the thesis and our reasoning behind its composition.

1.1. Our definition of e-courses and descriptions of models

Our working definition of e-courses is e-learning content presented as digital "courses," meant for training and competence development in organizations. What we deem characteristic of e-courses is that they usually require some level of engagement from the user, often through the use of interactive features integrated in their format. This engagement may involve for instance, clicking through course pages or taking quizzes after a presentation of content. E-courses are used to cover a wide range of topics (e.g., health and safety, leadership, and teamwork) in various organizations and institutions because of the flexibility they provide. Their content and features; how they may be presented and made available; and how they may be executed, can vary based on what needs or goals they are designed to cover.

Models intended for the evaluation of organizational training implementations are often re-purposed for the sake of evaluating e-courses. Of these existing evaluation models, we perceived three of them as the most influential within the field, based on our research; The Kirkpatrick model, the RoI Model (Return on Investment), and the CIPP model (Context, Input, Process, Product). We detail the central characteristics of these models, and why we think they are inappropriate for evaluating e-courses, below.

Firstly, we look at the Kirkpatrick model (Kirkpatrick, 2007). This model's development started in the 1950s. At that time, the field of workplace evaluation was relatively new and hence lacked a shared foundation and understanding. Therefore, the Kirkpatrick model quickly became a standard, because it offered a relatively simple and practical approach for evaluating training implementations in organizations (Chang, Reio, Roco, & Smith, 2017). The evaluation process requires those who conduct it (what we will refer to as *evaluators*) to complete 4 "stages" of evaluation. These stages concern, "Reaction" (user satisfaction and initial thoughts on the course itself), "Learning" (accumulated knowledge, skill and attitudes after taking the course), "Behavior" (the extent to which course takers apply what they learned from the course, in practice) and "Results" (the extent to which intended outcomes have been achieved after the course). This model has since been further developed, and its

modernized version is named the New World (NW) Kirkpatrick model, as a response to criticism of the original 50s version (Moreau, 2017). The most notable change being the weakening of the causal relationships between each stage (Moreau, 2017). The model was not originally meant for the evaluation of e-courses, but is still re-purposed for such use (Chatterjee, 2016).

The Kirkpatrick model influenced other models' adaptations and design. One such model is the Philip's ROI model (Burket, Philips, Philips, & Stone, 2016; Philips, 1996; Fusch, 2001). This model resembles the Kirkpatrick model in many ways, but includes an additional 5th stage, namely "Return on Investment" or "ROI". The evaluation process involves a cost-benefit calculation aimed at determining if the course had any financial return and was therefore worth the investment. This model also replaces the "Behavior stage" with an "Application and Implementation" stage, as it is meant to look more closely at the training itself, to inspect where errors might have occurred. The use of ROI became quite popular, as it presumably functions as an objective measuring tool of the real effects of an implemented course in a company. Hence, it is not unusual to see such cost-benefit analyses being used in other evaluation models under different names. It can even be seen as an integrated measure in the use of the Kirkpatrick model (Alvarez, Garofano, & Salas, 2004).

Lastly, we look at the CIPP model. This model evaluates courses by comparing the organization's goal for implementing a training programme with the recorded outcome of the implementation (Stufflebeam, 2000; Anwar, Faruq, & Sesriyani, 2020). This model is also split up into 4 steps (Context, Input, Process and Product). The evaluation process begins by having the evaluators define what goals and objectives the organization wants to achieve as a result of the course. When this is done, an implementation can be made with specific content meant to cover the goals that were initially set. As far as we have observed, it does not provide any specific guidelines on how to do so, but "inputs" are meant to be considered in light of the context and availability of resources (Stufflebeam, 2000). As training content is implemented, the evaluators must continually assess how well the course is being received and used, to look for needed improvements. The evaluation concludes at its "Product" step. This involves going over collected data to determine and measure how well the course achieved the goals established in the beginning of the evaluation, and what needs they detected for improvement (Amini, Bazrafkan, Dehghani, Esmaeilzadeh, Nabeibei, Kohuri, Rezaee, & Rooholamini, 2017; Cheng, & Zhang, 2020). This model is primarily used for the evaluation of curricula, public services and larger sets of courses in an organizational setting.

More so than for the evaluation of single or small-scale courses, or e-courses specifically (Stufflebeam, 2000).

Regarding criticisms the models have received, we will first address the Kirkpatrick model. It is seemingly quite cumbersome and time consuming, and one study indicated that most organizations seem to discontinue the evaluation after only completing step 1 (see figure. 1 from Horton, 2004). This could be due to user satisfaction being presumed to be a prerequisite for "good" learning. As a consequence of that presumption, the evaluators might also falsely presume that satisfaction implies learning (Chang et al, 2017; Holton III, 1996). In the later stages of the model, pre- and post-course tests are conducted. Such tests have also been criticized because of how unrelated mediating factors can sabotage the detection of causal links between course and individual learning (Moreau, 2017). The issue of mediating factors is also common within research that concerns effective teaching strategies for classrooms; though something may work in a laboratory, it won't necessarily work in classrooms. The social background of the students will vary, the school will vary, and the teacher's established practice will also vary. These variables will differ in real classrooms (Biesta, 2007). Workplace settings would have the same amount of confounding variables involved that could ruin the validity of a pre-post test approach.

Despite being widely used, the RoI model has been criticized for measuring fluctuations in an organization's output during a specific period of time, as opposed to measuring the learning a course may have led to (Berge, 2006). This could be because the model, like the Kirkpatrick model, involves time consuming steps. Meaning that by the time the evaluation is completed, the organization's output will have been influenced by other factors anyway, and so the evaluation cannot reliably show if output was affected by the specific training implementation or not. Furthermore, the ROI model cannot be used on courses that do not have any goal of delivering returns on investment, or capacity to do so (Abernathy, 1999). These would e.g. be courses about routine maintenance, or fire safety courses, that don't affect an organization's production or output in any noticeable way (Fusch, 2008; Berge, 2006).

There is little to suggest that the CIPP model would not be facing similar hurdles as those found in the research on use of the Kirkpatrick model. Meaning that it might still face issues of incompletion, and attempts at tracing behavioral change back to specific training interventions. Cheng, & Zhang, (2020) attempted to adapt the structure of the CIPP model,

making a model they titled the PDPP (Planning, Development, Process, and Product) model, which was specifically intended for the evaluation of e-courses. However, upon further reflection, we perceived this model to focus on measuring learning effectiveness according to user satisfaction, as opposed to investigating learning effectiveness by using variables that are more directly and reliably related to learning. It shares this trait with several of the previously mentioned models, contributing to and perpetuating a trend we take issue with. We consider the trend problematic primarily because of the fact that satisfaction cannot be said to necessarily equate or lead to learning (Holton III, 1996; Chang et.al, 2017).

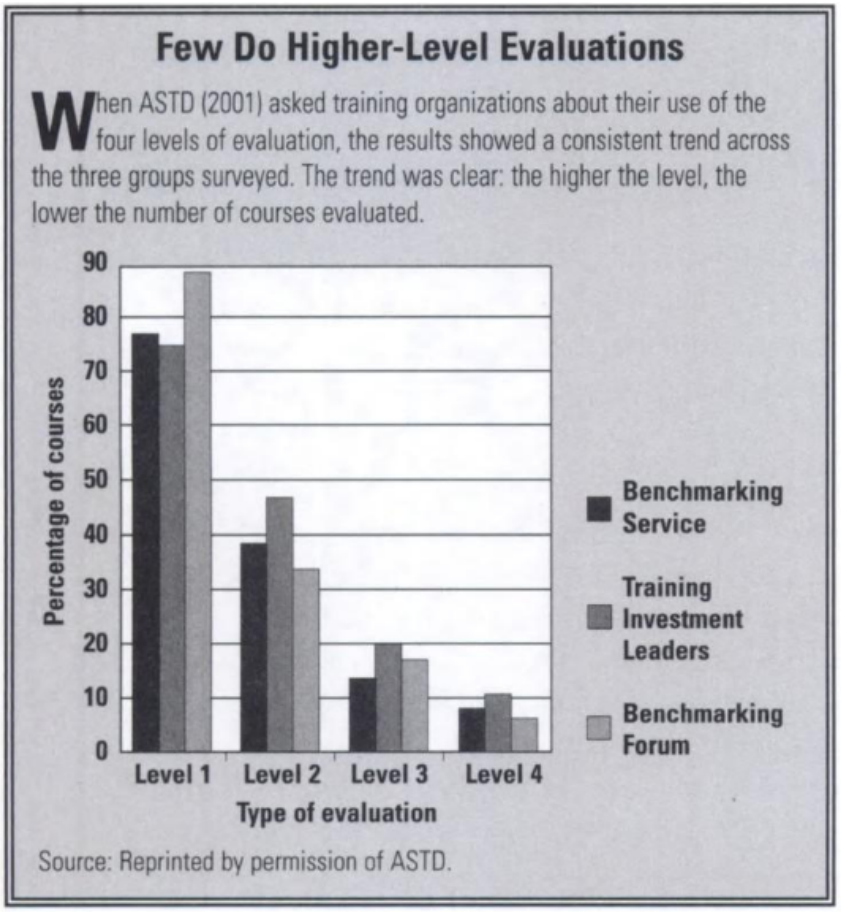


Figure 1: Extracted from *Evaluating E-learning* by William Horton (2004, p.10). This model is used to describe the use of the kirkpatrick model, using data from ASTD (American Society for Training & Development). Though step one evaluations are used more frequently, their value, in terms of determining the full benefits of training, are low. Value increases as the evaluator moves through step two, three and four (Horton, 2004, p. 10).

From our understanding, all three described models involve steps that attempt to trace learning back to a training implementation. Achieving results that reliably indicate causal links between observed learning and specific courses is altogether what we find it reasonable

to describe as a complicated process. One that seems too time-consuming and arduous for evaluators to find attractive or necessary to complete in their entirety. That is not to say that these models are useless. We would instead argue that committing to the completion of these evaluations might be too large an investment for them to be attractive in practice. Presumably, if they were to be completed in their entirety to evaluate the quality of a single and relatively "small" e-course, the resources required might exceed the cost of the e-course being evaluated. Considering these models are intended for training programmes, this might also mean that repurposing them would bring the mentioned issues into e-course evaluation as well. Perhaps also new issues specific to the way the model was repurposed. Therefore, we reasoned that a new evaluation model intended for e-courses would need to be simpler in its concept and execution. We also believe it should be designed in a way that allows for enough flexibility for it to be used on e-courses of varying scopes. This research, and our reflections around the models and their various criticisms, strongly affected how we chose to approach evaluation. Our approach will be detailed further in the thesis, when we also explain our methodical approach and theoretical framework.

1.2. Ambitions and research questions

There are three research questions we find it important to specify, as we progress into the structure and content of the thesis:

- "Workplace E-learning, does it work?"

The primary objective of our thesis is to suggest an answer to this question. We think it is an important question to ask because we perceive there to be a lack of interest and focus within academic research on the quality of e-courses, despite the prevalence of their use. We decided to design our own model for evaluating e-courses, in order to address the complex and widespread issue of how their quality can be checked. The goal of our evaluation model was to provide a viable and practical tool for organizations and workplaces to understand the importance of, and to conduct, evaluations.

- "How do we create an evaluation model for e-courses?"

This became a central question regarding methods and application of theory. We decided that gathering feedback from relevant experts with diverse competences, as well as researching evaluation practices and organizational learning was an appropriate approach. This design

and research process resulted in the creation of our model iterations, based on theory and informed by data.

The final research question we had to consider was unintended and unexpected;

- "How can guidelines for design be implemented as a part of the model?"

This question was prompted by our empirical research, as will be explained further once we elaborate on participants' impact on the model's development. The context and answer to this additional question will also be presented as we detail the process leading up to our results and the prototype.

1.3. Structure of the Thesis

The rationale behind the disposition of our thesis is based on our parallel application of methods and theoretical research, before conducting parallel design, data collection and analysis. As we will go on to explain, the methodological developments throughout our progress largely informed our theoretical research, as our approaches to evaluation and design changed over time. Due to the impact our methods had on our overall research over time, we consider it sensible to present our methods chapter before we explain the theoretical concept and framework behind the prototype model and its approach to evaluation.

We will present our methods in the following chapter. The core of our methodological approach will be explained, as well as how we came to develop what we consider to be our approach to evaluation. We will also explain our methods of data collection and analysis, before concluding the chapter by presenting our considerations regarding ethics, reliability, and generalizability.

The third chapter concerns our application and understanding of theory as a conceptual framework. This informed our design of the model's iterations, and the evaluation approach especially. This chapter will explain our epistemological perspective, based on constructivist and organizational learning theories. This perspective led to our evaluation approach being focused on the evaluation of e-courses' potential to facilitate learning.

In the fourth chapter we present the results of our combined methods and theory, as we present and display the iterations of our model. The results of our data collection and analysis are also included in the chapter, as we explain what feedback we received, and how it

impacted our design of the final two iterations. How the feedback was considered and applied will be detailed as it is presented, and finally the prototype model will be included in its entirety, followed by an explanation of our design rationale.

The fifth chapter will include findings of interest within our data, as well as discussion regarding our prototype, its relevance and implications for future research. Data that was not as directly relevant to our design choices as the feedback presented in the results chapter, but we still consider to be of considerable interest, will be presented and reflected upon. We also include our reflections and considerations regarding pilot testing of the prototype, and how we would like to conduct further research.

The sixth and final chapter will conclude the thesis as we review and reflect on our work, explain our key takeaways and relevant implications, and present our answer to the problem statements and main question of our thesis; “workplace e-learning, does it work?”

2. Methods

In this chapter we will describe our understanding of Design Based Research (DBR), and explain the decisions we made during, and leading up to, the design of our model. We will describe how we collected, processed, and analyzed data. Our sample of participants, their backgrounds and our reasoning for their selection will be explained. The chapter is concluded by presenting our considerations concerning ethics, reliability and generalizability.

2.1. DBR – what it is and how we used it

At the very beginning of Susan McKenney and Thomas C. Reeves’ book “Conducting Educational Design Research” (2019) the authors explain that Design Based Research (DBR) met their requirements for how to conduct research in order to improve existing practices in education. They also state that DBR may take wildly different forms of execution, and for this reason they do not attempt to present an ultimate “guide”. They also posit their doubt regarding if such a guide is at all possible. The method’s application depends largely on researchers’ needs and goals, as well as target field of improvement. The book is intended to offer their ways of answering frequently asked questions regarding the method. The book

therefore functions as a comprehensive compendium of DBR methods, models and studies. This book came to serve as somewhat of a bible during our work, along with a supplementary book providing an introduction to the purpose and use of DBR, edited by Tjeerd Plomp and Nienke Nieveen (2007). These books provided both foundational and specific principles, instructions, and context that has informed our understanding and application of DBR. The approach is unlike many others in the field of education, in that it seeks to achieve valuable results and understanding for both theoretical and practical purposes. As such, two main outputs of DBR according to the authors ought to be practical solutions that benefit their field of implementation, and valuable research contributions to the scientific field (McKenney & Reeves, 2019; Plomp & Nieveen, 2007).

DBR is an appropriate method when the research question is one without an obvious answer (Plomp & Nieveen, 2007). It is a method equipped with the flexibility to be used when addressing substantial problems with no simple solution, and where a solution would lead to a significant improvement within their field(s). In this context, our thesis' problem statement concerns the problem of e-learning course evaluation in workplace contexts. The current attempts at solutions seem to be the existing evaluation models, like those described in the introduction, around which there is little scientific consensus. The evaluation of learning and e-courses can be considered a "wicked problem". Such problems are similar to open problems, but not as simple to solve, due to the complexity of the problem. This makes finding a solution frustrating and potentially impossible (Rittel & Webber, 1973). New solutions for complex problems, designed through DBR, can be appropriate to consider as innovations with implications for practices and developments in their respective fields (McKenney & Reeves, 2019). Hence, we find the method appropriate when addressing the problem at the center of our thesis.

DBR has several "models of execution," explaining how it may be conducted, all of which allow for some deviation and flexibility in their application during research. The models define iterative, cyclical repetition of research phases over time, in order to continuously improve and build upon innovations. The phases are typically dedicated to the investigation of a problem, the development of solutions, and the solutions' refinement through evaluation and subsequent reflection. The final phase is intended to be conducted cyclically in order to refine solutions over the course of several iterations (McKenney & Reeves, 2019). By doing this, a solution is much more likely to be implemented in the practice(s) it is intended for.

The first phase, involving the investigation of a problem, entails the formulation of a problem and consequent research questions. Preliminary research then provides a basis for the next phase, which is the exploration and development of solutions. This second phase is a process of conceptual design, in contrast to the more theoretically and empirically grounded first and third phases. The designs of conceptual solutions are then evaluated through empirical testing or assessment, during the third phase. Evaluating the solution allows for reflection after analysis of results, to determine what improvements and changes ought to be made. At different stages of refinement, appropriate evaluation strategies can be used to improve the solutions' soundness, feasibility, broader institutionalization, local viability, immediate effectiveness, and/or long-term impact. Our evaluation strategy will be explained when we present our selection. The phases mentioned often vary in their execution, but generally still involve the same fundamental processes in some form (McKenney & Reeves, 2019; Plomp & Nieveen, 2007).

We completed three iterative cycles of refinement. Throughout the phases we reflected a great deal on how the gaps between theory, practice and implementation, as well as the target group's desires and varied contexts, might be bridged. These reflections were necessitated by the occurrence of such gaps between the received feedback and what we considered to be theoretically sound and defensible. These gaps were however expected, and prompted the need for trade-off decisions that involved compromises to improve the solution (McKenney & Reeves, 2019). The primary trade-off decisions we made are included in our results chapter. They will be described as we present data that was relevant to our design process, as an important aspect of our reasoning behind how feedback was considered and used.

It is common within DBR to focus on use-inspired design, as part of the development and iterative refinement of solutions intended to be applied to and change practices. Solutions ought to be explored in such a way that they may be used by the "owners" of the problem. Hence, design is often informed by feedback from (or developed in collaboration with) the problem "owners" (McKenney & Reeves, 2019). There are several ways in which to conduct use-inspired design research, through the *evaluation* stage of the DBR process.

Our evaluation process began after the research-informed design of Iteration Zero was completed, as a theoretical framework and foundation for the following iterations. Iteration Zero was reviewed by our thesis supervisor, to see if our application of theory was appropriate and if it was ready to be evaluated by the participants. Iteration One, and the

subsequent Iteration Two, were evaluated by participants in order to refine the model into a prototype through use-inspired design. In the Results chapter we will detail the processes of refinement as we present the analyzed data we collected during the iterations' evaluation.

With this methodological framework outlined, the development of our focus and approach to our problem; methods of data collection and analysis; and relevant considerations regarding our method, will also be elaborated on in their corresponding chapters.

2.2. Iterative design and research

As previously mentioned, the methods within the DBR framework are best applied when adapted to researcher's own project-related needs. Our needs changed throughout the project, hence requiring several changes in our methodology and theoretical approach to the problem. We will briefly present the stages of this project's evolution, as an illustrated timeline, showcasing the development of our research focus and methods through several iterations.

The design of our conceptual model draft, and the model's approach to the evaluation of e-courses, was an iterative cycle in and of itself. This process consisted of copious brainstorming, discussion, and a parallel research and design process. The LGA Facilitation model was created bit-by-bit, as we explored our way through various pre-iterations and configurations of content, and what research to apply. This first resulted in the creation of Iteration Zero, and the process was since repeated during the design of each of the three following iterations. We will explain the model's concept and approach in this subchapter's final subsection.

2.2.1. Discarded approaches

Here we will present an illustrated timeline meant to communicate the stages of our research and the evaluation model's conceptual development. In summary, after almost a year of research, and discarding several approaches to evaluation and model design, our theoretical perspective on evaluation shifted towards constructivist learning theory instead of behavioral. This made it necessary to once more reconsider our methodological approaches to design, development and research, as well as data collection. The result of this exploration of approaches will be explained in the following subsection, as what we refer to as our final and

current evaluation approach: Evaluating individual courses based on their pedagogical soundness, by assessing their facilitation of Learning Goal Achievement. On the following page we present the timeline as context to its creation, by briefly detailing the predecessors to the conceptual approach and model.

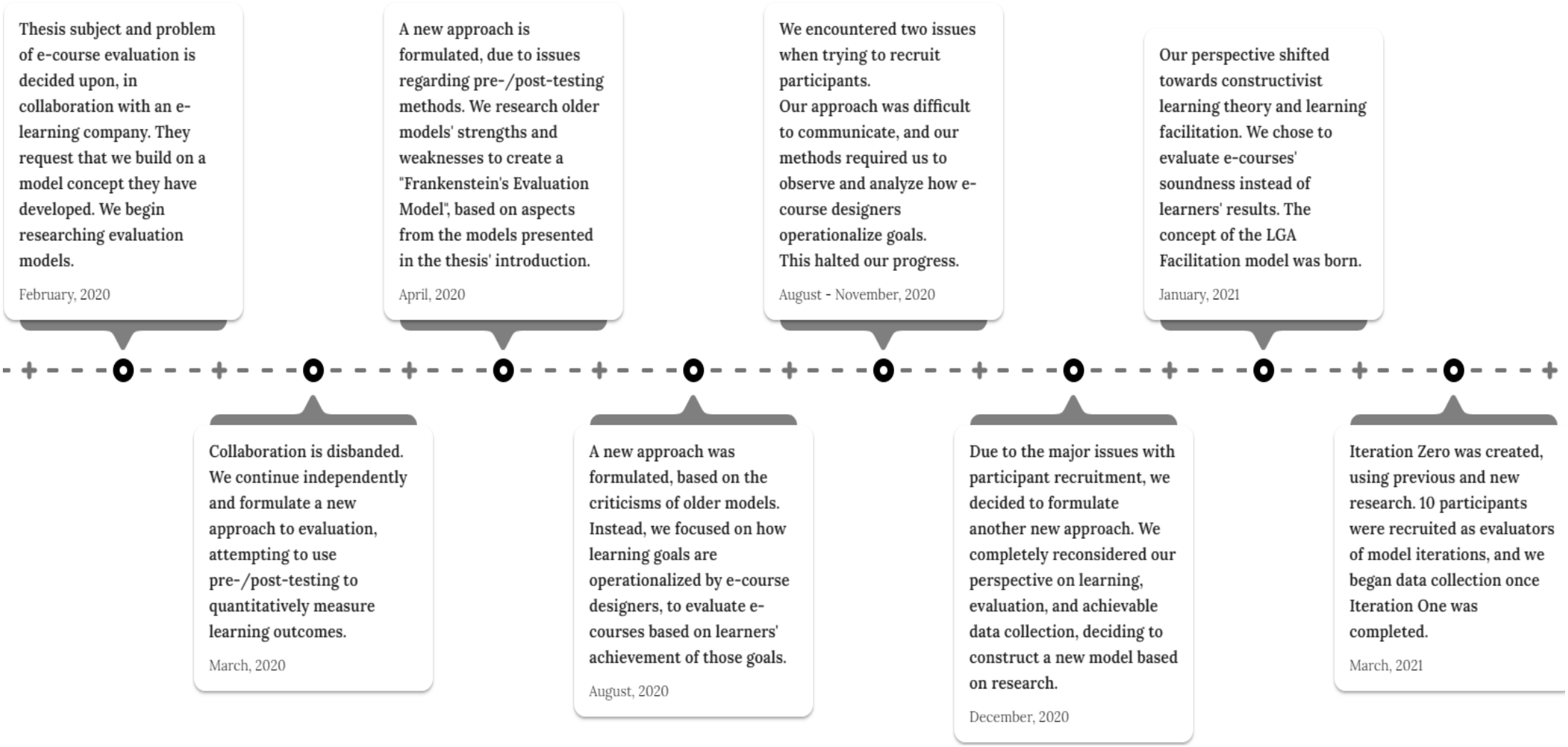


Figure 2: Timeline made using https://padlet.com/

2.2.2. Final approach to evaluation

Reflecting on lessons from previous approaches, we concluded that our model ought to be easy to use; time-efficient; and yield clear results, to be practical and “attractive” to implement. We shifted our focus, from thinking about how an e-course can result in learning goal achievement, to focusing on what an e-course *does*. Focusing on the courses’ attempts to facilitate learning goal achievement, instead of the course-takers' learning. This will be expounded upon further in the theory chapter, as we present our perspectives on learning theory, which have informed this approach to evaluation. The reasoning behind this shift, is the premise of pedagogically sound e-courses being more facilitating of the course takers’ learning. Thereby our approach to evaluation became focused on the pedagogical soundness of e-courses. Evaluating the e-course, not the learner.

We decided to invent our own model using the lessons learned and our new approach to the pedagogical evaluation of e-courses. In the process of designing the new model, we steered away from quantitative methods, the combination of existing models, conducting observational data collection, and the operationalization of learning goals. We focused on making the model as easy to understand as possible, with as few steps as possible, and to provide the evaluator using the model with a reasonably sound result. In order to achieve this, we conducted research on learning theories and learning facilitation, the context of workplace learning and adult learners, and much more, while initiating the development of the model.

2.3. Empirical research and considerations

To create a prototype fit for later testing, we employed the DBR strategies that provided feedback which guided the following refinement of the iterations. We collected data by having participants evaluate our first two iterations of the model, and influenced our design processes. Hence, our data collection was conducted parallelly to the development of our model iterations, as iterative cycles where the processes were somewhat intertwined.

We created the last two iterations using the most common, and occasionally original or interesting, design-related feedback as inspiration and guidance. We were provided advice on many different topics, including specific issues such as research material, visual presentation and illustrations, or things as simple as misplaced or misspelled text. The feedback was collected using surveys with open-answer questions and during audio recorded interviews,

documenting the feedback and coding all personal data. The feedback was then analyzed by coding and categorizing the feedback, before it was applied during the design work following the feedback rounds.

We will further explain our choices regarding empirical methods and our selection, as well as data collection, analysis and use. Finally, we will address broader concerns relevant to the thesis, such as ethics (primarily regarding GDPR), reliability, and generalizability.

2.3.1. Participants and selection

“Developer screening” and “Expert appraisal” were the recommended strategies we found the most appropriate for the evaluation stages of our iterative design process. These strategies involve collaboration with our target group to gain a better understanding of them and their problems, contexts, needs, and desires (McKenney & Reeves, 2019; Plomp & Nieveen, 2007). In this section we will present information about our participants’ involvement, backgrounds, occupations and our reasoning behind their selection. The participants consisted of 6 women and 6 men.

Ten participants took part in the first round of data collection, providing feedback on the first iteration, and ten took part in the second round. Two of the initial participants did not, or did only partially, participate in the second round, but two additional participants were included. These were recommended and recruited through the participants. The total set of collected data consisted of 10 full responses per model iteration, as well as one response consisting only of survey feedback on Iteration Two. More on the collection and analysis of data will be explained in the following section of the subchapter.

The following table presents the trends we consider interesting within the selection.

Categorization of participants:	**Education specialists**	**HR/administrative workers**	**E-course designers**
Number of participants:	**4** (Three men and one woman)	**5*** (Three women and two men)	**3** (Two women and one man)
Number of participants in each round:	**First round: 3** **Second round: 4**	**First round: 4** **Second round: 5**	**First round: 3** **Second round: 2** (1 only delivered survey data)
Basis for categorization:	Participants with current occupations within an institute of higher education, some with ICT-related pedagogical competence and/or tasks. All were educated and possessed degrees within the field of pedagogy.	Participants within current occupations that involve some degree of administration, internal production, or use of e-learning. *One participant within the public administration of education.	Participants with current occupations within a commercial e-learning company, managing and/or partaking in e-course production.
Findings from the analysis of participants' data:	9 out of the 12 participants in the selection had some form of pedagogical background.These ranged between HR-oriented pedagogy, pedagogical research, and children's education.	HR/administrative workers were the most represented group, based on current occupation. Two of these workers did not have a background within HR/administration, but rather within teaching and education.	The e-course designers' backgrounds varied widely, and each had diverse combinations of skills and experience. Their attitudes towards e-courses and their function also varied greatly.
	Equal number of men and women in the selection, with relatively equal variation in competences within gendered groups.	Most of participants' combinations of current work, experience, and education fell into several different categories.	The selection exemplifies the expected, complex variance in the target groups' skills and backgrounds.

We selected participants who could fit into our target group, within the three categories of occupations listed in the table above, to get feedback on the model's content, design and usability. By recruiting a sample from the target group of the model, the goal was to strengthen the soundness and feasibility of our design, as well as to improve local validity and potential institutionalization of our results. (McKenney & Reeves, 2019; Plomp & Nieveen, 2007*)*. These participants functioned as representatives of problem-owners, who encounter or are invested in problems related to e-course evaluation. Since they represent stakeholders and potential model users, they could provide feedback that would aid in our use-inspired design process (McKenney & Reeves, 2019; Plomp & Nieveen, 2007). For reasons of scientific rigor, we have primarily sought external respondents to evaluate the model iterations. However, we recognize that engaging four participants within our own field of study and institution, might somewhat impact the reliability of that rigor (Plomp & Nieveen, 2007).

2.3.2. Data collection

Our data collection was conducted in several steps, on multiple occasions, as we will detail here. Some of our reflections regarding our methods of data collection and conducting interviews will also be presented, as we deem appropriate.

We provided an information letter, which is included among the thesis' appendices (see Appendix I), to individuals who expressed their willingness to participate and provide feedback. 12 out of 15 selected participants submitted their consent to participate in the same online platform as the one in which the information letter was presented. An application owned and administered by UiO, Nettskjema (for more information visit: uio.no/english/services/it/adm-services/nettskjema/about-nettskjema.html), approved for such purposes and the storage of "yellow" data. Which is the only classification applicable to the data we have collected, stored, and analyzed. If they chose to submit their consent, they were then forwarded to a three-question form page.

This form was used to collect the information we used to analyze their backgrounds and competence, and to detect the trends presented in the previous section. We detailed what

information we would request within the information letter, repeating the requests at the top of the form where it was to be submitted. We also included explanations of our reasoning behind these requests, namely to collect data providing insight into the skills, backgrounds, occupations and experience of our participants. This was necessary in order to report on the trends within the sample and argue their representativeness for the user group as the reason for their selection.

After the collection of our participants' consent and basic background information, drafts of the iterations were sent to the participants via the UiO Outlook e-mail system. These drafts consisted of individual documents for each of the iterations, which we dubbed "packages". They each contained an introductory explanation of the model, two illustrations of the model, and finally a description of each step in the model with instructions for execution. We will detail the contents of each iteration and package when we present our design results along with feedback in the results chapter.

When the packages were individually dispatched to the participants, these were accompanied by invitations to a survey form in Nettskjema. Each iteration came with its own survey. Individual survey answers were used to make interview guides unique to each participant, addressing their specific responses. The same survey questions were used in both feedback rounds, in order to compare the feedback provided in each round. This also allowed us to see if the participants' understanding, perspectives and disposition towards our evaluation model changed after the first iteration. Certain trends, and deviances from them, were thereby made clear during our analysis. The survey questions are added in the thesis' appendices (see Appendix II).

The interviews were held digitally, and audio was recorded using the Nettskjema application "Diktafon". We took supplementary notes both during and after the interviews, while listening to the recordings. These recordings were securely stored, like the survey submissions, on Nettskjema's servers. This allowed us to access the data without managing or storing them on personal devices or unauthorized programs. More information on the GDPR considerations and data security precautions will be detailed in the subchapter's final section. These interviews were semi-structured, with an added emphasis on establishing rapport and the exchange of ideas. The aim of this was to create an interview situation where the participant could potentially benefit from the interview as well as ourselves (Aslam & Lee, 2019). The intention behind this was for the process, as well as the product, of our work to be

a beneficial contribution to its field of implementation (McKenney & Reeves, 2019). This approach was inspired by previous research done within participant-involved ethnography (para-ethnography) (Ciuk, Konin & Kostera, 2018), and "feminist qualitative research" (Bryman, 2016).

This approach also seemed appropriate because we wanted to establish a casual tone in the interviews. We did not want participants to potentially feel tense or as if they could not be direct and honest when being questioned. Rather, we encouraged them to share whatever they had to say, regardless of if they personally thought it might be useful feedback or not, which often proved useful. This seemingly allowed for the participants to be quite open with us, and it allowed us to make the most of the time we had with them. During the second round, when interviewing the participants we had interviewed before, the rapport established during the first interview often seemed to carry into the second. The method led to the collection of a considerable amount of rich data, requiring thorough and time-consuming analysis with what we consider to be very interesting results.

During the interviews, we would also ask participants for their thoughts on topics or issues that were not directly related to their submitted responses. This provided us with a rich variety of perspectives on potential refinements and changes. Many suggestions or ideas were built upon by the participants themselves, leading to further idea generation and reflection, and more design-relevant data. Obtaining feedback on specific issues and ideas from several sources aided us in discerning what paths might be more attainable or productive than others to explore. This gave us rich sets of data to analyze from each round, which was useful when redesigning the second iteration and prototype.

We have considered in retrospect that some of the feedback received early in each of the rounds may have been somewhat more impactful on our design than other feedback. When participants spoke of the same issues as previously submitted feedback, either spontaneously or when asked, it was quite often validated or built upon by others' unique perspectives. Some of our most engaged and invested participants were generally interviewed relatively early in each round, and were generally also quick to respond to the surveys. Hence, points of interest within their responses and interviews may have been more influential. We do not believe this necessarily harmed the validity of the design, rather strengthening the validity of the feedback we applied due to unison within the selection. However, occasionally discussing certain feedback with several participants may have led us to miss other feedback those

participants might otherwise have provided.

2.3.3. Data analysis

The data from each round was organized in a spreadsheet dedicated to each iteration. Specific and relevant points of feedback were analyzed and coded into categories, summarized and fit into cells under each participants' representative codes. This processing of the data was conducted according to guidelines of Coding Analysis (Allen, 2017). The coding of data was done both separately and cooperatively, in tandem. For the benefit of the validity of our analysis and findings, we discussed, assessed and agreed on the appropriateness and reliability of the categorization scheme (Allen, 2017). These categories were placed in intersecting rows, according to what aspect or part of the model they were relevant to. Our method of selecting data for analysis involved identifying feedback that we perceived to be useful for specific developments, changes and refinement. This is a common method of feedback analysis, coding data according to implications for development and evidence of design propositions, specifically relevant to designing the next iteration (McKenney & Reeves, 2019). Content of interest within the coded feedback will be presented in the results chapter. The feedback was categorized according to its relevance to the following aspects of the model iterations:

- **Content and execution of steps;** Which proposed developments or criticisms the participants provided, specific to the individual steps and content in the model.
- **Design and presentation;** What issues the participants had with interpretation of the illustrations, and the visual formatting of the contents or text.
- **Communication;** What problems the participants identified when analyzing the structure, examples and language.
- **Feasibility and use;** What suggestions the participants made to improve user friendliness, interaction with the model, or probability of use.
- **User group and features;** Who the participants believed the model might benefit, where, as well as what might improve upon the possibilities and options of use.
- as well as other reflections, attitudes, opinions and advice.

We consider it worth noting that the trends in our data showed a great deal of harmony and complementary feedback within the sets of data relating to each iteration. By this we mean there was generally little discord amongst the individual participants' feedback. Most participants gave unique feedback regarding certain aspects of the model, based on their individual experience, competence and interests. However, during our final analysis of the collected data, we did not find many responses to be directly contradictory to each other. There was only one participant who provided specific feedback that deviated considerably from the trends in our data. We will present some deviations from the general trends in the results chapter. When we discuss our findings, we will present trends that were not specifically relevant to design refinement, and the critical participant's responses, in greater detail.

2.4. Ethics, reliability, and generalizability

The primary ethical considerations relevant to our project were concerns regarding GDPR. In order to conduct empirical research, we submitted a research application to NSD (the Norwegian centre for research data) (for more information visit www.nsd.no). Ensuring that our methods and plans for the data collection were scientifically and ethically sound by having them approved, as is also obligatory whenever conducting empirical research.

The application detailed what data we would require, and how we planned to acquire, store and process it. It included the information letter, a list of survey questions, and explained how we would base interview guides on the survey data.

Approval of our research methods allowed us to collect data through consent forms, surveys and audio recordings, as described in the application and information letter to the participants. All data was collected through Nettskjema and its Diktafon application, thereby also stored there, and we processed the data by using secured channels in the UiO Teams-domain. All services used in relation to our empirical data were provided by UiO and approved for the collection, storage and processing of "yellow" classified data.

One participant submitted background/occupational data we specifically instructed them not to submit in the initial form, due to its classification as "red" data. Their submission was immediately deleted from the Nettskjema platform. Only their relevant "yellow" data was

then coded and stored in a table overview of all the participants' background information, separately from their personal information and a separate code-key document.

All information directly connected to the participants (names, contact information and background information) was collected during the Nettskjema session in which they submitted their consent to participation, and basic background information. This personal data was then put into a spreadsheet, stored separately from the rest of the data. We initially created codenames, before finding a system for replacing these with randomly generated four-digit codes, matching each participant to their submitted data. This allowed us to identify which participant had submitted which responses, without revealing their identity within the feedback data. These code keys, connecting the identity of our participants and their feedback responses, were kept in a secure folder separated from all other data.

Regarding the reliability of our methods and results, we were concerned with the following issues: Our participants' representativeness; the reliability of our data analysis; and the application of our analyzed feedback data.

How representative our sample is, of the target group and fields of practice relevant to the use of our model, is difficult to say. We recognize that the educational and professional backgrounds of the target group, will in all likelihood vary widely. Several of our participants' competence could be categorized within more than one field, due to there being a wide variety of educational and professional backgrounds within the sample. This is something we would expect, considering the likelihood of such variety within the represented fields, and in general within various professions. Therefore, we do not consider our sample to be entirely unrepresentative. However, when analyzing the overview of the sample's education and professional experience, we did identify an overrepresentation (9 out of 12 participants) of some form of what we would consider pedagogical backgrounds. We cannot presume that this aspect of our sample is representative of the wider target group. We do not have reason to assume that the majority of workers, within all three represented fields, would have similar backgrounds to our participants. We can also not assume that the majority of our target group has pedagogical backgrounds, similar to our sample.

We would argue that the reliability and accuracy of our data analysis is reasonably sound. This includes our analysis of survey responses (in order to create interview guides), interview recordings, and systematic coding of the sum of data from the interviews. During the interviews, we would ask the participants about specific parts or aspects of responses in their

survey, whenever clarification or elaboration was necessary or beneficial. We also made sure to ask the participants if our understanding of their feedback was correct, while discussing clarifications, elaborations, or following arguments and reasoning. We attempted to ensure that our interpretations and analysis of their feedback from the survey, and during the interview, was reasonably correct. Hence, we would argue that our understanding of the feedback and method of coding it, allowed for reliable analysis and application in our iterative work.

When considering our method's generalizability, we considered the following:

Issues related to the model's relevance and use outside of Norway; issues related to users interpreting and adapting the model to fit their practices; how widespread the criticism we received might be; and what criticisms we may have missed out on, considering our relative lack of highly critical or negatively loaded feedback.

Finding a great degree of harmony within our feedback, from participants of varying organizational affiliations and backgrounds, gives reason to assume some degree of generalizability between similar organizational contexts within Norway.

We attempted to increase external validity, and thereby generalizability, by leaving room for some interpretation and integration into existing organizational practices. This was done by avoiding strict guidelines regarding specific parts of the evaluation. By taking into account the likelihood of the model being interpreted by users in such a way that it fits into their practice, we designed it with the intent of it being somewhat adaptable, without losing its purpose. We attempted to make its purpose clear, and convey the intent and significance of each step, to avoid it being misunderstood and misused when adapted.

Considering that we only captured one highly critical voice, there might be a lot of criticism we missed out on due to our limited number of participants. This could be an issue for generalizability if it turns out the most critical participant is somewhat representative of a larger portion of our target group. Although, judging from our gathered feedback, there is little reason to assume that this is the case as of just yet without further research. Further considerations, as well as ambitions and implications for further research, will be discussed in the findings and discussion chapter.

3. Theory

In this chapter we will describe the theoretical foundations for our design choices. Firstly, we will describe our learning perspective. We have been influenced by constructivist learning theories, namely, social and cognitive constructivist learning theories. These will be described before looking at how they may complement one another. Secondly, we will walk through our grasp of organizational learning theories for this thesis. We will begin defining knowledge intensive organizations and knowledge workers. Afterwards, we look at the SECI (Nonaka, Toyama, & Konno, 2000) model of knowledge creation, to illustrate a view of organizational learning relevant for our model development. After these theories are described, we will begin to form our conceptual framework by combining the two. We agreed upon this framework because it combines theories from our respective *master's programs*. Thirdly, we discuss the epistemological implications this framework carries. We argue that since organizational learners are active participants, course-user interactions need to be viewed as more than a one-sided process of a course transferring knowledge into the user. This is discussed using Sfard's (1998) acquisition and participation metaphors, to distinguish between viewing "knowledge as object" (Ibert, 2007) and "knowledge as practice" (Orlikowski, 2002). We end with describing why evaluating e-courses based on how well they facilitate learning, is a more viable approach than evaluating how well they deposit learning into the user. This is meant to provide a context for understanding our research process and model design choices throughout its three iterations.

3.1. Constructivist learning theories

Constructivist learning theories assert that learning is an active process of constructing knowledge and understanding, from various experiences that are personal to the learner (Woolfolk, 2014; Afifi & Alamri, 2014). There are two constructivist learning theories that emphasize two different sides of the spectrum of such a process, social constructivism and cognitive constructivism.

3.1.1. Social constructivism

Social constructivists emphasize learning as a chiefly social process. Individual knowledge construction occurs in social interactions, like groups, where individuals may share and build

upon common knowledge (Ahmed, Boruff, Menon, Rodriguez & Thomas, 2014). One of the chief influences on social constructivism is Lev Vygotsky's sociocultural learning theories. Though his theories concern the teaching and learning of children, they are still used in theorizing and planning adult learning (Dysthe, 2005 ; Ahmed et.al, 2014)

Vygotsky (2015a; 2015b) argued that human beings develop by interacting with their environments, as opposed to learning through passive reception of stimuli. "Interaction with the environment" constitutes interacting with one's surroundings, and the people therein, using "cultural artefacts". He meant that the development of all higher psychological functions, were mediated by cultural artefacts, which can be defined as physical objects and symbols used to understand and communicate in a society (Woolfolk, 2014). This means that human development consists of internalizing cultural artefacts that are formulated by adults or skilled peers (Woolfolk, 2014;Vygotsky, 2015a). The most important of these for a child's development are language, which was viewed as fundamental for forming individual thought (Cakir, 2008). Therefore, in order for learning to happen, there needs to occur an active construction of knowledge from interacting with cultural artefacts. This could, for instance, take shape in conversations between two people, where thoughts are shared and synthesized (thereby constructing knowledge), mediated by language. (Dysthe, 2005)

Vygotsky also argued that every child had a Zone of proximal development (ZoPD) (Vygotsky, 2015b; Cakir, 2008 ; Befring, 2014). This refers to the area of a child's skill level, where they cannot solve problems without guidance from an adult or skilled peer (Vygotsky, 2015b; Woolfolk, 2014). In order for a child to learn something from a challenge, the difficulty must be set high enough for the learner to reach mastery with assistance. However, the difficulty cannot be too high so that mastery is out of reach altogether. ZoPD highlights the importance of skilled peers and adults; this can be seen in group work where learners assist one another in achieving goals and mastery (Dysthe, 2005; Woolfolk, 2014).

From a social constructivist perspective, we can argue that human learning is best utilized in social interactions. Therefore, when implementing learning interventions, it is seen as important to construct situations where learners need to engage in a dialogue with each other (Dysthe, 2005). This can be done by proposing a problem for teams of learners to solve. Making groups of individuals with varying skill levels also utilizes the learners' ZoPD, because the learners need to assist one another as to attain any sense of mastery. (Ahmed et.al., 2014).

To summarize, social constructivists argue that learners are affected by their cultural and social surroundings. The processes of constructing knowledge and understanding are affected by the cultural artefacts available, and by the peers one is surrounded by in the environment. When creating learning implementations there is an emphasis on facilitating social interactions. This is often done using groups, where the individual members are of varying skill level, as to encourage learners to construct knowledge collaboratively.

3.1.2. Cognitive Constructivism

Cognitive constructivists emphasize the individual's role in the construction of knowledge and understanding (Cakir, 2008; Woolfolk, 2014). Learning is therefore viewed as a result of information processing, where the individual actively interprets and constructs own understanding of the environment (Kantar, 2014; Afifi, & Alamri, 2014). One of the central theorists of cognitive constructivism was Jean Piaget, who's work greatly influenced the field. Though his theories primarily concern the teaching and learning of children, they are still relevant in discussing adult learning (Cakir, 2008)

In Piaget's research on child development, he argued that children would learn by creating "schema." Schema can be defined as mental habits for categorizing and understanding experience (Bremner, Holt, Passer, Smith, Sutherland & Vliek, 2015). He posited that through processes of "Assimilation" a child would fit new information into an existing schema. If the information was too novel and did not fit into any current schema, then they would create new ones by processes of "Accommodation" (Woolfolk, 2014; Beefring, 2014; Cakir, 2008; Chen, & Lewis, 2010). For example, if a child spots a dog running across a field; the child may understand that this is in fact a dog, because they possess a schema for "dog." However, when the child comes upon a cat, he calls her a "dog." This is because the child has assimilated the new "Cat" information into the "Dog" schema. To understand that this animal is in fact a cat, and not a dog, the child would need to accommodate this information by making a new schema. (Bremner et al, 2015)

With his research, Piaget would go on to criticize contemporary schooling practices (Befring, 2014). He would argue - to the effect - that the mechanical use of rote learning and strict discipline sabotaged the learners. He argued that good teaching methods had to facilitate the learner's need to develop and change schemas. This means that schools should open up more

for individual exploration and play in the classroom. The competencies that learners should develop in school is something that they need to construct themselves by exploring the settings of various environments. (Befring, 2014)

Piaget was criticized for not specifically defining precisely what schemas are (Woolfolk, 2014; Befring, 2014). However, the term is appropriated by researchers today to describe "a mental framework – an organized pattern of thought – about some aspect of the world" (Brenmer et al, 2015). Other terms are used to describe something similar for instance, Novak (ref in Cakir, 2008, p.197), defines "Concepts" as a way of "slicing up and organizing the world." Memory, attention and inference are used to stitch together understandings of the world that allow the individual to make informed choices in the environment (Cakir, 2008). The development of concepts is continuous and unique to the individual. This means that they take new shape when the individual encounters something novel, or is communicating with someone who is using different concepts. For simplicity's sake going forward, schema will be generally understood as cognitive frameworks for understanding and categorizing experience, schemas are altered through processes of accommodation and assimilation.

What this means for learning then, is that knowledge construction can occur through processes of creating and altering mental schemas, or concepts. Schemas, as they change and develop in complexity through assimilation and accommodation, can then be used in tandem with other schemas to understand increasingly complex tasks. Therefore, when it comes to creating learning interventions, cognitive constructivists would put emphasis on tasks that allow for the learner to learn through exploration and interaction with the environment. This could take the form of vaguely defined tasks, that require the learner to interpret and understand. Such tasks would also be created with the learner's prior knowledge in mind, as to best facilitate construction of new knowledge (Ahmed et al, 2014; Cakir, 2008; Woolkfolk, 2014; Bremner et al, 2015).

To sum up, cognitive constructivists would argue that learning is a result of mental schemas changing to adopt novel information into one's own understanding. In this way learning can be viewed as a result of internal processes of creating or adding to one's own understanding. Thus, learners in cognitive constructivism can be viewed as individual explorers, attempting to make meaning of the surrounding environment.

Cognitive constructivists emphasize the individual's role in learning, whilst Social constructivists view learning as a social process. For the sake of the thesis, we are deciding to

view social and cognitive constructivist theories as two sides of the same coin. We view them as complementary, as opposed to competing. By doing this we seek to allow for a more open investigation of human learning, which is appropriate for a complex workplace context – where learning may take more forms than one (Littlejohn, 2017; Colley, Hodkinson, & Malcolm, 2003). Learning is viewed as a creative process of individuals constructing knowledge based on their own prior knowledge and experience, as well as knowledge shared and constructed between other individuals.

3.2. Organizational learning theory

Organizations relevant for our model's development and use; would be those that work with e-learning production or platform providers; HR in larger or smaller businesses; organizations involved in similar work with digital course production, administration and quality assurance. This encompasses workers who administrate, procure and/or design e-courses.

In light of the above, we can say that the ideal workplace context of our target group is "knowledge intensive organizations". Such an organization can be characterized by their input and output being related to knowledge creation or using knowledge in novel ways (Newell, Robertson, Scarbrough, & Swan, 2009). It is not unusual for knowledge intensive organizations to have a flat hierarchical structure. This means that management is in a weaker position to demand or decide on behalf of the workers. Instead, the management's job revolves more around enabling and providing for their workers' needs (Newell et.al, 2009; Styhre, 2011; Alvesson, & Karreman, 2004; Lai, 2011). This is in part to sustain a healthy learning culture that has a larger focus on openness and enabling knowledge sharing.

According to the literature, the workers who sustain such organizations are the "Knowledge workers." These are employees whose work is defined by novel problem solving, creativity and teamwork within knowledge intensive organizations (Frenkel, May, & Korczynski, 2002). They are given a high degree of autonomy, as they work to create solutions to problems of varying novelty, sometimes within interdisciplinary teams (Newell et al, 2009; Styrhe, 2011). In knowledge intensive organizations the workers do not only use knowledge in their work, but it is also the result and product of the work itself.

In such a work structure, individual learning and by extension organizational learning, is the foundation of the organization's competitive advantage (Basten, & Haaman, 2018). It is

therefore vital to sustain learning within the organization for it to survive. How to practically organize such learning, is what organizational learning theories are about (Basten, & Haaman, 2018). For our model development, we used the SECI model to understand what learning in organizations may look like.

Nonaka et al (2000) argues that knowledge creation in organizations is best viewed as a dynamic and creative process of transforming "explicit" and "tacit" knowledge. This occurs through processes of "socialization, externalization, combination and internalization" in different contexts (called "*ba")*.

Explicit knowledge refers to knowledge that can be expressed in a systemic and formal way, often taking physical or digital forms so that it can be shared and processed. Tacit knowledge refers to knowledge that is intangible and individually owned, therefore it is expressed through actions, values and emotions (Nonaka, 1994).

The transformations between explicit and tacit knowledge, occur in specific contexts. Nonaka et.al (2000) argues that knowledge without context is information. The distinction can be found in how knowledge has a clear use for its context, whilst information does not.

> *For example, `1234 ABC Street' is just information. Without context, it does not mean anything. However, when put into a context, it becomes knowledge: ``My friend David lives at 1234 ABC Street, which is next to the library.''* (Nonaka et.al 2000, p.7)

In their work, Nonaka & Konno (1998) uses the concept of *Ba* to describe a "shared context" or place where creation happens. The idea is that no knowledge creation occurs in a vacuum, and as such, one should consider where the knowledge may be embedded. *Ba* are described as physical places, but they can also be mental or digital places. *Ba* can also be a combination of the three, meaning that how individuals interact to create knowledge varies depending on *ba*. Therefore, how knowledge is treated, processed and transformed is determined by its *ba*. This means that the processes of transforming explicit and tacit knowledge, each occur in their own *ba*.

Nonaka et.al (2000; Nonaka & Konno, 1998; Nonaka, 1994; Newell et.al, 2009) describes Knowledge creation as starting with processes of Socialization, this occurs in "Originating *ba"*. In this *ba,* individuals share feelings, emotions and maintain bonds face to face. Tacit knowledge is exchanged between individuals in the form of informal discussions or meetings where ideas can be shared about e.g the direction of a project or solutions to a problem.

Processes of Externalization occur in Dialoging *ba.* Knowledge is transformed from tacit to explicit in an environment more goal-oriented than originating *ba.* By engaging in a discourse, individuals agree upon shared meaning for terms, analysis and ideas. This can occur in situations where teams are assembled in order to make plans for a project for example.

Processes of Combination occur in Systemizing *ba* (Nonaka et.al, 2000). This is where explicit knowledge is exchanged and combined. This can occur when individuals gather in digital or physical places to share and alter each other's work. Knowledge is treated and processed in form of a virtual or physical object.

Processes of Internalization occur in Exercising *ba*. This is where explicit knowledge becomes tacit again. This is enabled by peers, or an instructive expert, formulating explicit knowledge in a way that allows it to be used in practice. The idea is that explicit knowledge is integrated into practice, e.g. through experience or formal simulations.

The strength with using the SECI model is that it highlights how dynamic and multifaceted knowledge creation, thereby knowledge work, can be. It also underlines that a large amount of learning in organizations go undocumented, unforeseen or otherwise unaccounted for. This is important to note, because it shows how learning influences practice outside of formal learning contexts. For example, colleagues will learn from one another by sharing ideas and giving feedback on each other's work, outside of formal learning contexts where learning is planned (Colley et.al, 2003; Eraut 2007). The model has been criticized for not incorporating what influence organizational politics has on knowledge creation. Instead, the processes of knowledge creation are seen as something smooth and uninterrupted, undeterred by the obstacles that may get in the way (Newell et.al, 2009). Though Newel et.al (2009) refer mainly to the 1994 version of the model, Nonaka et.al (2000) discuss the effects of knowledge assets and leadership on the SECI process. However, these criticisms and rebuttals weren't fully addressed or considered before our model work. This is reflected in our data, as one participant pointed out the issue of how organizational strategy and policy impacts learning practices. We will elaborate on this when presenting our results.

3.3. Conceptual Framework

In our model work we have used the SECI model and constructivist learning theories in tandem, to make a conceptual framework to understand our learners. We argue that our learners are active, and that how they interact with the e-course is influenced by their experiences in the organization. This reasoning is based on our synthesis of the SECI model and constructivist learning theories below. We argue that these theories complement one another, and that this provides a framework for understanding how a worker learns within an organization.

What cognitive and social constructivist learning theories share with the SECI model, is viewing learning as an act of engaging with content to construct something new. This can be seen if we use constructivist learning theories as a lens to interpret the transformative processes of Socialization, Externalization, Combination and Internalization. According to Nonaka (1994) learning in Socialization comes from "being in the environment" (Nonaka, 1994, p.42; Nonaka et.al, 2000, p. 9). This would involve informal learning in practice or between individuals (Nonaka, 1994; Nonaka et.al, 2000). From a social constructivist perspective, we could say that Socialization implies learning by interacting with cultural artefacts, for instance in groups where new knowledge is synthesized from shared ideas and thought (Dysthe, 2005; Cakir, 2008). By externalizing tacit knowledge, we can see individuals work in groups to socially construct explicit knowledge (Nonaka et.al, 2000) using what knowledge is shared between them. Externalization can also be likened to the use of group work, when making learning interventions using social constructivist learning theories (Woolfolk, 2014). With cognitive constructivism, we could argue that Combination of explicit knowledge can only occur after novel knowledge is understood in context of prior knowledge. This is something we can see in Nonaka (1994) where emphasis is put on "diffusing" and "organizing knowledge" before dissemination (Nonka, 1994, pp. 45- 44). Nonaka described Internalization as workers "learning by doing" (Nonaka, 1994, p.20 ; Nonaka et.al, 2000). From a cognitive constructivist perspective, this implies workers having to actively explore the explicit knowledge, to internalize and integrate the novel explicit knowledge into their own practice. With social constructivism we can also underline how Internalization is enabled by ZoPD. This is seen when Internalization involves receiving aid from skilled peers or an expert, in the form of "training programs" or "simulations" (Nonaka et.al, 2000).

In light of the above, viewing learning as something inherently creative and therefore constructive, is a place where the theories align. We can see how the theories view the learner as an active participant who constructs new knowledge based on what they already know. Knowledge, in the theories, is viewed as something that is developed continuously, independently, and socially throughout and between practices. In this way, understanding and hence learning, is built in the interactions between the individual and the environment, as well as between other people.

Constructivist learning theories would also argue that when creating learning interventions, that the content be authentic to a setting the learners would realistically find themselves in (Befring, 2014; Ahmed et.al, 2014; Kantar, 2014). This is also an important point in Internalization, because learning tasks ought to be related to the work the learner engages with in the day to day. "...there is a growing body of evidence that professional learning is more effective when integrated with work tasks" (Collin; Tynjälä; Fuller & Unwin; Eraut, referenced in Littlejohn, A. (2017).

The overlap between the SECI model and constructivist learning theories highlight how they may complement each other in practice. Firstly, constructivist learning theories show that learners in organizations can be viewed as active participants in their own learning. Secondly, The SECI model shows that organizational workers learn in more ways than one, and often learn in a way specific to a certain context. This provides a type of micro-macro look at our learners; where constructivist learning theories provide a "micro" perspective of learning, that encompass individual learning scenarios between learners in groups or individually. The SECI model can instead be used to look at learning from a "macro" perspective, which encompasses the learning that occurs between groups and across contexts in the organization.

What this means practically for evaluating e-courses is that we cannot only be interested in how the user and e-course interact, but also how the learner and e-course relate to their environment. This implies that even though a user may construct new knowledge from interacting with an e-course, that learning may not be used if it doesn't fit into relevant practice. This can also further imply that the learning doesn't necessarily occur in person-course interactions. Rather, learning can occur after taking the course, within social interactions, or individual reflection in one's own practice. This also underlines the importance of being aware that learners bring their own preconceptions, prior knowledge and experiences to any learning situation. Other researchers have used similar theoretical

considerations on adult learning. For instance, Holton III, Knowles, & Swanson (2015) argue that adult learning is affected by the adults' concept of self, adult-learner experience, readiness to learn, orientation to learning, and motivation to learn (Leigh, Hamilton, & Whitted, 2015).

Constructivist learning theories argue that learning consists of actively constructing knowledge based on what the learner already possesses, or what is shared between individuals in groups. The SECI model argues that knowledge creation occurs through processes of transformation between being individually possessed and intangible (tacit), to being external and given form (explicit). We would argue that using these theories in tandem allows for a wider understanding of learning that more appropriately encompasses the complexities of learning in work life.

3.4. Epistemological Implications

Using our framework, carries with it some epistemological implications. We realized this as we were combing through literature and noticing that we were using language that implies that learners are "taught by" or "learn from" a given e-course. The issue with this sort of language is that it sets up a false power dynamic between user and course; in that the course is teaching the learner, but the learner is not using the course to learn. The distinction may seem subtle, but the former implies a view of the learner as a passive receptor of course content, as though the course can transfer knowledge into the user like transferring files between computers. This touches on an important epistemological distinction between knowledge as object and knowledge as knowing.

Viewing "knowledge as object", implies that knowledge is something that can be transferred, stored, acquired and lost (Ibert, 2007). Knowledge in this way is an external entity that remains static across contexts. Therefore, it can be possessed and transmitted from person to person and is static in how it presents itself, essentially viewing knowledge as a property or something pre-existing waiting to be discovered (Sfard, 1998; Ibert, 2007).

"Knowledge as practice" means that knowledge emerges in the context of people's actions (Ibert, 2007). There is less focus on knowledge as possession but rather as "knowing in action," knowledge is therefore seen as something a person *does* (Orlikowski, 2002). For this reason, knowing is also viewed as being intrinsically embedded in a person's practice. This

means that knowledge as such, cannot be directly removed or transferred from one context or person to another. Instead, a person is viewed as participating in a practice by enacting relevant knowledge. Therefore, knowing in action often involves becoming a part of a wider community, like a profession. (Sfard, 1998).

In organizational learning theories, some researchers decide to put a greater emphasis on knowledge as practice (Newel, et.al, 2009). The reasoning is that by incorporating this view, we become more aware of how knowledge and its place in work takes place in a wider field of practices: How practices relate or overlap with one another ; How knowledge seemingly "sticks" to practice, in that without context knowledge loses value ; That knowledge, as a core aspect of a workplace, influences how workers relate and identify with one another (Styhre, 2011). Arguably, using knowledge as practice allows for a more holistic approach to studying now workers relate and use knowledge in and across their practice.

Sfard (1998) discusses these distinctions in terms of Participation (Knowing as practice) and Acquisition (Knowledge as object). She argues that although these metaphors signify contrasting if not contradictory views of learning, they can still be used in tandem. One such approach would be to view Acquisition as precedent to Participation. Meaning, that by acquiring knowledge, the learner is then participating. For example, a student can acquire knowledge while writing a PhD in isolation, but by doing so they would also gain entry into an academic community, by participating with the practices of academic research.

Deciding upon how to use these metaphors, will influence how we view the function of an e-course. Evaluating e-courses using Acquisition as our metaphor, could mean seeing e-courses as possessing knowledge that the user would need to retrieve. This does not consider how that knowledge fits with the worker's overall practice. This also does not consider how workers may share different learning experiences from using the same course.

This is not to say that we should discount the Acquisition metaphor. Viewing knowledge as Acquisition can prove useful, when discussing how knowledge may be shared between people, in the form of physical or cultural objects for instance. However, this is an incomplete understanding. Acquisition does not occur in a vacuum, and how the learner uses the knowledge acquired would depend on the context and practice of the learner. This means that the Acquisition of knowledge can be seen as Participation in learning environments. These environments in our case, are the practices within knowledge intensive organizations.

3.5. Evaluating Facilitation

Seeing as though learning is something that is not only acquired, but also participated in, means that we must look beyond how e-course “teach”. Instead, it would be more appropriate to look at how workers can use the course to learn within their own practice.

One way of evaluating e-courses in this way could be to investigate the users after they had taken the e-course. This could involve comparing the user’s practice before and after taking the course, this may take shape in the form of measuring behavior change, similar to other evaluation models (Chang et.al, 2017; Kirkpatrick, 2007; Moreau, 2017). This would arguably let us evaluate using the Participation metaphor, because any learning derived from the course would be integrated into practice. Though it would not be much of a leap to say that users would Internalize (Nonaka et.al, 2000) learning acquired from e-courses into practice, a part of such a process would be exchanging learning with others (Vygotsky, 2015a; Vygotsky, 2015b). This means that it would be difficult to untangle what learning derives from the course and what learning comes from elsewhere. In other words, the myriad of informal learning experiences would serve as confounding variables. One could argue that this does not matter as long as we see a behavior change. However, this does not let us know if the e-course itself contributed to this change or not.

Another way of investigating if an e-course is helpful for worker’s learning, would be to look at the e-course itself. This means questioning if an e-course possesses certain traits that facilitate learning. This way, we could avoid having to measure variables that are invariably confounded by events in the workplace. Evaluating based on something more arguably reliable, like what facilitators the e-course has, could be a viable approach. What a facilitator looks like then, would be the next question.

The term facilitator is usually reserved to describe a person. Berta, Cranley, Dearing, Dogherty, Squires, & Estabrooks, (2015) describes a facilitator as “someone who acts and enables others to implement a practice change. (...) The role of the facilitator is to help and enable rather than to prescribe” (Berta et.al, 2015, p.6). The facilitator is also described as a role that functions to guide and encourage the learner to reflect on one’s own practice and determine where changes need to be made (Berta et.al, 2015). In this way, the facilitator's role is to guide and not dictate a person’s learning process. Arguably this does not sound too

different from utilizing the learner's ZoPD, by helping them reach mastery in challenges that are outside immediate grasp of the learners.

This understanding of the facilitator, seemingly does not stray too far away from how the term is used in the context of e-learning. Merril (2003) defines effective online facilitation as a process that starts with developing learning objectives, before creating authentic activities relevant to the users (Merrill, 2003, p. 14). These activities should be learner-centered, meaning the course ought to facilitate learners by providing content but leave room for individual engagement and interpretation. Facilitation should be a process of guiding and enabling the user to learn in a way that appeals to them.

Though the term facilitator normally refers to a person, it seems an e-course can possess features that could serve similar functions. This could take shape in the e-course as use of activities and techniques, that allow the user to achieve the learning goals set by the course. It is on this basis that we decided to incorporate the term in our model. “Facilitators” are defined in our thesis as features and tools that an e-course incorporates to enable learning, thereby making an e-course pedagogically sound. We use the term “Soundness” to indicate if an e-course has incorporated facilitators effectively to the extent that it helps the user to achieve learning goals. E-courses that are not sound either do not have any facilitators, or they have a dysfunctional use of facilitators. We use the term “Dysfunctional use,” to refer to an e-course that may have facilitators, but they are used in a way that disrupts or otherwise does not contribute to enabling learning. Dysfunctional use could for example be excessive use of punishments or rewards, group work without clear instructions, or overloading users with information. By focusing on facilitation, we can evaluate an e-course by looking at what it does to help the users learn within their own practice.

3.6. Summary

To make an evaluation model geared towards knowledge workers, we need to understand who they may be and the environment in which they operate. We conceptualized their workplace as one where challenges require novel solutions, teamwork and a management that is focused on enabling their work instead of controlling it. Therefore, we posit that such a model needs to be anchored in a wide and complete understanding of human learning, as to mirror the practices the model may be used in.

We used the SECI model and constructivist learning theories to make a conceptual framework to understand how our target group learns. We determined that our learners are active, constructive, and that their learning is influenced by their experiences in the organization.. The learner's experiences consist of individual learning scenarios and group learning scenarios. These scenarios also overlap, in the sense that learning in one scenario can be passed on or influence another scenario. When learning is viewed as something so complex, it becomes difficult to evaluate a course by measuring or tracing learning back to the course. Learning is seen as more than just a process of acquiring knowledge from a course, it also involves participation with the learning environment. Taking this into consideration, evaluating based on how courses facilitate learning in the user's own practice can be more appropriate.

Facilitation is a term often used to describe the role of a person to guide or support a learner. However, an e-course can have a similar function, when it uses pedagogical tools and features, that allow the user to achieve the learning goals set by the course. Therefore, we developed Iteration Zero using these key theoretical points: Learning is a complex constructive process that occurs across contexts. Therefore, it is complicated to effectively trace learning back to a specific source. E-courses do not "teach" the user, but rather facilitate the user's learning. E-courses that are "sound" have effective facilitators that support the user's learning.

4. Results

In this chapter we present our model iterations as the results of our design processes. We will also report the results of our data analysis. Because the richness and total amount of data we collected was quite overwhelming, we only included the feedback we found the most useful or interesting to consider and apply. Analyzed feedback will be presented according to the coded categories detailed in the methods chapter. Each subchapter includes descriptions of the individual iterations, presented in chronological order, except the final prototype which will be included in its entirety.

Following each iteration, we will present the feedback we received on it. We will explain how each iteration's feedback impacted the next iteration, including what trade-off decisions or compromises we made, and what we prioritized. In the final subchapter we present our final result, the LGA Facilitation Model prototype. Following the prototype's presentation, we will detail our design rationale. We will explain our choices regarding content and presentation, through interpretation and specific application of feedback.

4.1. Iteration Zero

Iteration Zero of the LGA facilitation model (see Appendix III) is the basic academic foundation of later iterations, and the only version we did not send to the participants. It includes in-text references for our design choices and application of theory, which remained largely the same in later iterations. We will briefly explain the content in this iteration before we describe the feedback we received from our supervisor.

Iteration Zero presented our approach in detail, and argued why it should be used instead of other models. It begins by describing what the LGA facilitation approach is, and what pitfalls we thought other models struggled with and we wished to avoid. We explain our perspective on learning, and the content of each step in the model. Following this, we present the three steps to our model followed by a bibliography. The basic premise of the model is that if e-courses are meant to help with learning, then they would need to be pedagogically sound in their facilitation of learning. Hence, our evaluation model is meant to help the evaluator determine what features and tools are being used in the e-course, and how well they are used. The first step to this process is figuring out what specific learning the course seeks to facilitate. Secondly, the evaluator identifies the features and tools the course uses to facilitate

learning (“facilitators”). Finally, the evaluator needs to check if the learners experienced facilitation.

Step 1 involves defining relevant learning goals for the e-course being evaluated. The guidelines we included, involve looking for learning goals in the course or asking someone who might know. We considered the issue of finding “hidden” learning goals, meaning that the learning goals stated in the e-course do not truly represent what the user expected to learn (Engelsen, 2015). This was not included because we thought it asked too much of the evaluators. We wrote a great deal about learning theory while transitioning into Step Two, because different learning goals can be facilitated by different learning theories. We explain that behavioral theories could act as a sort of infrastructure, giving a framework for issuing feedback, rewards and punishments. Social and cognitive theories were viewed as more content- and activity related, requiring more engagement from the user of the e-course (Mayes & Freitas, 2007; Afifi & Alamri, 2014; Chen & Lewis, 2010; Woolfolk, 2014).

Step 2 is meant to help the evaluator identify facilitators in an e-course, by giving them an overview of relevant facilitators based on pedagogical theory. This overview outlines pedagogically sound features and tools, used in classrooms and e-learning alike. The facilitators included were chosen based on their representation in various literature and our curricula over the course of our education.

After the evaluators had identified the facilitators within the course, they would check if the learners experienced being facilitated in Step 3. We created a survey format, allowing the evaluator to simply insert relevant information. That way, the step would require minimal effort, and help evaluators collect survey answers to determine if facilitators were helpful to e-course takers. When answering the survey, the e-course users would confirm or deny if these facilitators aided in their achievement of learning goals. This data would indicate whether the e-course was pedagogically sound.

4.1.1. Feedback and development

For this iteration, the only feedback we requested and received was from our thesis supervisor. We used this feedback to refine the iteration, thereby creating Iteration One. The main takeaways from our feedback on Iteration Zero were these:

The content itself was too theoretically heavy and written too academically, making it more suitable as thesis content than a model for the participants' review. Furthermore, the language made information and instructions within the steps unclear. We were encouraged to be concise, limit the document to five pages, and include illustrations that communicate the concept and content of the model's approach, in a brief and simplified manner. Some of the references were considered a little too old or misplaced in the content. Brunner, Ross. & Wood (1976) for instance, has little to do with digital scaffolding.

4.2. Iteration One

After reviewing the feedback, we worked on shortening and making the content in Iteration Zero. We only included information we considered necessary for our participants to understand and respond to. To keep the number of pages to a minimum, we did not use any page breaks. We also changed the font because we did not want the participants to feel they were receiving an academic paper instead of a draft of a practical evaluation model (see Iteration One in appendix IV).

The first page still acted as a "sales pitch", but summaries of the steps were shortened, and a fictional e-course we used as an example of steps' functions and execution was introduced. Two illustrations were included in Iteration One. One illustration depicted the evaluation process from start to finish. The other was a Venn diagram depicting the ideal result of an evaluation, and was meant to illustrate the concept of our evaluation approach.

The guidelines in Step 1 were mostly unchanged, but we did change the overall presentation, length and use of language. We removed all in-text references, for the sake of shortening the package, but kept the bibliography to communicate that we based our assertions on sources. Our use of sources within Step 2 was approximately the same as in Iteration Zero. We attempted to use language more precisely, so the references from Iteration Zero were more appropriate. We also added "humor" as an additional facilitator in the table because we considered the effects it has on retention and activation (Banas, Dunbar, Rodriguez, & Liu, 2011; Fitzpatrick, 2010; Hackathorn, Garczynski, Blankmeyer, Tennial, & Solomon, 2011) to be reason enough to add it.

The survey structure from Iteration Zero remained unchanged, except an added survey response option, which concerned the possibility of users not experiencing a facilitator's

presence or effect. This could indicate if the facilitator was dysfunctional, and that it may need to be reexamined. The facilitator may also have been wrongly perceived or insufficiently described in the survey, meaning the results concerning that facilitator could be less significant when interpreting the overall results.

These illustrations were included in the second iteration package's introduction:

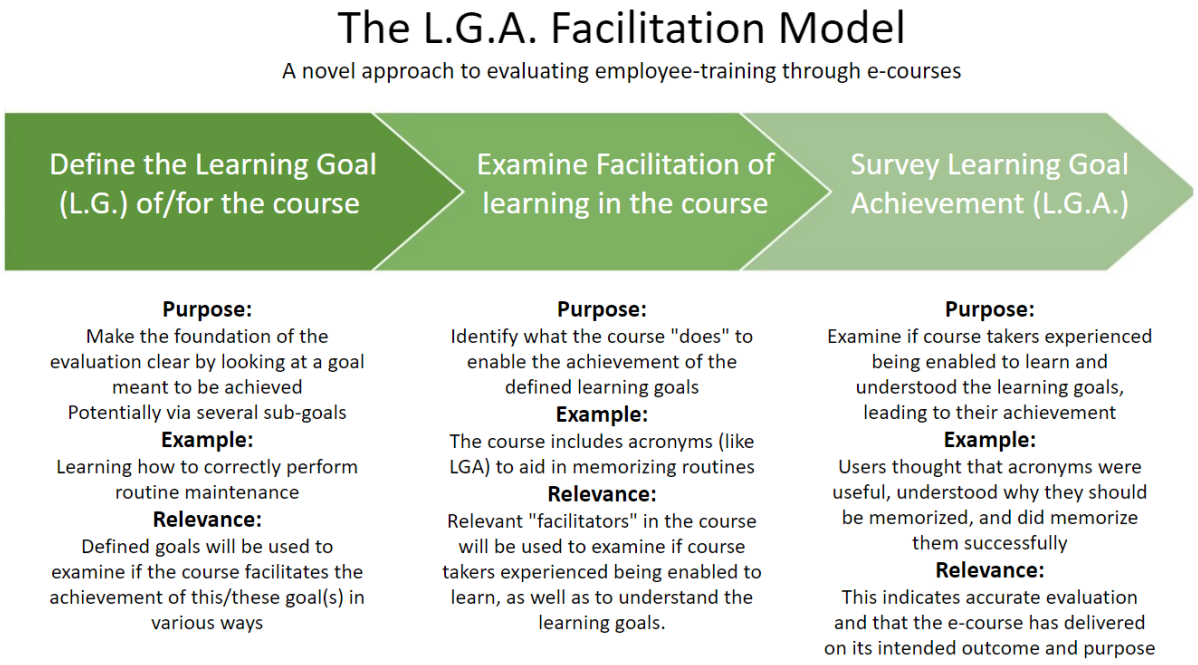


Figure 3: Illustration of the LGA Facilitation model for Iteration One.

Figure 4: Venn diagram used for Iteration One to show potential results of evaluating.

4.2.1. Analysis and use of feedback

After incorporating the above changes we sent out the model to our participants for feedback. In this section we will present the results of our feedback analysis and how they were used or considered during the development of Iteration Two. We present the results according to how the data was categorized during our application of coding analysis, which was explained in the methods chapter; *Content and execution of steps* (which includes feedback regarding specific parts, and added features/content); *Design and presentation*; *Communication*; *Feasibility and use*; and *User group and features.*

"Content and execution of steps"

Which proposed developments or criticisms the participants provided, specific to the individual steps and content in the model.

Feedback in this section will be presented according to their relevance for each step in the model. We conclude this category with notes on the participants' thoughts on the inclusion of design guidelines parallel to the evaluation guide's steps.

Step 1

All the participants agreed on how important learning goals are for designing and evaluating e-courses. One participant even stressed that if learning goals are not clear, then the e-course content would not be effective despite how sound it may be.

Including a template or guidelines to aid the evaluator in making and defining learning goals, was recommended. Such guidelines could help evaluators see if present learning goals are clearly formulated, and if the e-course's content is relevant to present goals, or goals made for the evaluation. It was remarked that such guidelines could aid in e-course design as well, because it would help designers be mindful of the learning goals' intended purpose.

Overall, the concept of including design guidelines was highly approved of. It thereby became a priority when redesigning Step 1 in the second iteration. Guidelines were also included to aid in the identification of learning goals, and their creation by designers or evaluators.

Step 2

10 out of 10 participants approved of the table, or at the very least the concept behind it. The participants liked it for different reasons, positing that it could be used as a sort of checklist or source of inspiration during e-course design or evaluation processes, to ensure focus on pedagogical soundness and facilitation. However, they generally agreed that it came across as quite heavy reading material, and it was a good idea to omit the references from the table to simplify it. In Iteration Two we thereby omitted our bibliography as well, and attempted to shorten the content without making it too vague.

One participant was very opposed to the inclusion of humor as a facilitator, arguing that its influence on learning is questionable and lacks substantial scientific consensus. Saying, “the jury is still out on that one”. 5 out of 10 also argued, or agreed with the argument, that certain facilitators might be more effective than others, due to complexities that would enrich the learning experience. Categorizing the facilitator table was recommended, to make it easier to see the facilitators’ purposes. We were also encouraged to “break it up” to allow for easier navigation and use, as it was also considered quite dense. Our initial idea, categorizing according to learning theories, was opposed by a participant who confirmed our suspicion; this would be unnecessary, and probably confusing.

All feedback on the structure of the table was considered during the refinement of Step 2 in the second iteration, and we decided to categorize facilitators based on function. We perceived some of them to serve a “structural” purpose, defining the content and use of language in the e-course. Some were categorized as “basic” due to their potential to function as foundations for other facilitators and activities to be facilitated. The final category of facilitators require more engagement from the user, and hence was called “activites.”

Step 3

The amount and variation in the feedback we received regarding Step 3 was by far the richest, both in terms of amount and variation. It was for sure the step we had developed the least, primarily due to uncertainty about how the survey approach might be improved. We

wished for further feedback before developing or redesigning Step 3, and discussed it in more detail than the previous steps.

All participants agreed Step 3 needed improvement. 5 out of 10 informants expressed it was unclear what evaluators were supposed to do with the survey data. How the survey was supposed to be made was also unclear, and the need for an improved template was emphasized. One participant wondered if the number of facilitators was supposed to indicate pedagogical soundness. This highlighted the need to clearly specify guidelines evaluators could use to interpret data in Step 3, and conclude the evaluation by attaining useful results. We further developed the survey guide in Iteration Two by including an improved example, and based the survey format on a Likert scale. This involved having the respondents express their agreement or disagreement with presented statements, using a 5-point range between total disagreement and agreement (Bryman, 2016).

Our survey approach was also criticized on the basis that it requires the survey taker to employ some level of metacognition, and that several forms of biases would likely be prevalent issues. It was also posited that the completion of such a survey might require too much effort from workers for it to be completed properly and by an appropriate number of users. We aimed to make the survey simple, using short but valid questions and answers. One participant also pointed out that we do not mention the importance of a varied, proportionate and representative sample of users, if a survey is to yield valid results. This is something we included and encouraged when designing the final prototype.

One participant suggested that quizzes and tests would indicate whether learning has happened, assuming they are well designed. This means that the tests would require the user to actually apply their learning, as it would be too difficult to complete the tests by pure guess-work or luck. During further development of Step 3, we considered the validity of such tests and their requirements for completion. We arrived at the conclusion that their results could potentially function as analytics that, if valid and appropriate, could be triangulated with survey results. Therefore, evaluators would be able to interpret results with greater certainty, than if they were relying on only measuring subjective opinions or user satisfaction.

We were told that the LGA facilitation approach was appropriate for evaluation, because it focuses directly on the activities a learner is exposed to, as opposed to user satisfaction, which is more indirect. The reasoning behind this, seemed to be that engaging with something that is “good for learning,” would be more likely to lead to learning, while

satisfaction has a smaller effect on learning. We found this to validate our approach, and that we were on the right track, at the very least. This also corroborated the critiques from Holton III (1996), Horton (2004), and Chang et al, (2017) on evaluations that only use the Reaction step of the Kirkpatrick (2007) model, which measures user satisfaction and initial thoughts on the course itself.

Including design guidelines in the model

One participant argued that adding design guidelines parallelly to the entire evaluation guide would be sensible, as both processes may follow similar or the same pedagogical principles. We introduced this idea to the other participants as well, unless they also suggested it, to verify if this was an idea worth pursuing. The results indicated general approval, and occasional enthusiasm, also among the e-course producers. One of these participants also added that they observed a lack of accessible, academically and pedagogically grounded models and “standards” for design. We therefore attempted to include discreet design principles and advice throughout Iteration Two, while maintaining the model’s primary focus on evaluation.

We asked the participants what they would say good design work and production entails. For the most part, they stated that the design process often begins, and should begin, by considering its target group. Participants with experience in e-course design (7 out of 10), stressed the importance of knowing your target group when designing goals and content. The choices and use of facilitators should fit the user group, their needs, knowledge and skills. During design guideline development, we considered emphasizing this, but the focus we placed on it was reduced during the final refinement of Iteration Two.

The aforementioned participants also considered e-courses to be more effective when used in tandem with other activities. This gave us a few ideas on how to encourage effective follow-up after e-course use, however this seemed too complicated to integrate into the next iteration. One participant informed us of three important principles tied to creating e-learning content, within their practice; create a narrative structure, reward learners' progression, and stimulate learners' conversation about the content after the course. We kept this in mind when creating design guidelines, and the ambition to stimulate learners to talk about the content

seemed to correlate with the importance of e-course follow up. However, this focus seemed difficult to integrate without including follow up guidelines in the model as well.

"Design and presentation"

What issues the participants had with interpretation of the illustrations, and the visual formatting of the contents or text.

We were informed that the illustrations' content needed to be presented in a clearer way, with more specific and concise explanations. The model's visual presentation was generally viewed as decent, but also confusing by some. Primarily due to the example included with the steps' explanations being different from the one used in the rest of the package. Also, the progression of the steps was unclear to one participant, as they thought we should communicate clearer what step came first, and how they were connected. The issue seemed to stem from the horizontal arrow-format of the steps' headlines. The document was overall perceived as very "academic" and heavy, presented as a thesis rather than a model that was meant to be interesting to engage with, discuss and use. During further refinement we improved the visual presentation of the package document and the illustrations, in order to make it more enticing to read and attractive to use.

"Communication"

What problems the participants identified when analyzing the structure, examples and language.

The document we sent out read as heavy and disorganized at times, and so a lot of feedback concerned a need to simplify our content. It was emphasized that the easier it would be for the target group to get intrigued and engaged by it, the more likely they are to read the text, understand the model and use it. Hence, we were also encouraged to make the entire package take up fewer pages, as one participant found the page number a bit intimidating and unattractive. We attempted to shorten and simplify Iteration Two and its content, having it take up fewer pages.

We received some criticism regarding how the intent and use of the steps should be more clearly defined. The most critical participant however, expressed that they found the message and approach clear, while criticizing the message and approach itself. 3 out of 10 participants requested a Norwegian translation of the model, for ease of reading and improved likelihood of the model's integration within nowegian organizations. We considered this to be too impractical considering the scope of our thesis, and we therefore decided not to prioritize it.

We also received feedback on the package' structure and use of examples: One participant mentioned the importance of including an abstract, as an overview of the whole model which could be used to communicate it briefly. We were also told by a participant who printed the document out for revision, that we ought to add page numbers. The example we included in the introduction and used throughout the steps did not illustrate the steps and content clearly, and we should consider revising it. 3 out of 10 participants thought the example was more confusing than it was helpful. One also found it unclear if the same example was used throughout or not. The use of examples was therefore changed in Iteration Two.

2 of 10 were concerned that the term "facilitator" already occupies a certain meaning in organizations, which could confuse users who understand "a facilitator" as a person, not a feature or function in an e-course. We briefly considered using "enabler" instead, but reasoned that it might be similarly criticized. Due to the difficulty of finding a replacement, and that "facilitation" is a central part of our approach, we decided not to change it.

"Feasibility and use"

What suggestions the participants made to improve user friendliness, interaction with the model, or probability of use.

One participant noted the benefits of using incentives, in order to encourage correct use of our model. It was argued that this could be necessary, as many users might rely on shortcuts and simplifications of our model when executing an evaluation. This interested us as a potential consideration for further development, and so we attempted to verify this with other participants. There were two participants who argued for the use of "approval stamps." These stamps would indicate that our model guarantees that an e-course is "sound", if evaluations conducted with our model say so. We considered adopting quality assurance as an incentive into the model.

6 out of 10 participants stressed that our model could be very useful and feasible for use if it was formulated in simpler terms. This was not only to save the user's time, but it would also make it easier to understand and apply in practice. In addition, adjusting the document's formatting, as to make it more pleasing to the eye, could go a long way in making it more engaging. Using templates and flowcharts was proposed to improve user friendliness, because of how they can illustrate specific instructions and the progression of the steps. It was also noted that this type of model could be well suited for use across several groups and departments within organizations, for example as a tool to aid in collaborations between team members.

"User group and features"

Who the participants believed the model might benefit, where, as well as what might improve upon the possibilities and options of use.

7 out of 10 found the model's target group and context to be unclear, in terms of what context the model was meant to be used in, and by whom. One participant shared that we did not clarify how the model was to be used, in context of wider organizational strategy. We did not consider this when designing Step 1 in the first iteration. This was an oversight in our conceptual framework of the model itself. Our use of the SECI model does not adequately consider the implications of how other organizational factors can affect knowledge creation. Hence, it did not occur to us as relevant, and we did not realize its significance. We verified this with the rest of the participants, who agreed with the importance of e-courses' context and purpose. This led us to take the issue into account when developing the evaluation guidelines further. In Iteration Two, learning goals were encouraged to be considered in light of how they fit into the larger organizational learning strategies and similar contexts.

After explaining our intended target group to these participants, they largely agreed that our model would be useful for this group. In addition, two participants posited that it would be appropriate for users who were inexperienced with designing e-courses. This gave credence to the idea of developing design guidelines, but it also meant we needed to more clearly define our target group in the next iteration.

One participant stressed that Step 3 ought to lead to results that are easy to interpret and use. This meant we needed to consider how the model might allow users to interpret and present

results to others, in a relatively short amount of time. This is something we kept in mind when developing Step 3 further, as it seemed to be an important factor that could impact feasibility and attractiveness.

All participants agreed that e-course evaluation is important and presented varying but overlapping reasons as to why: One participant mentioned that evaluation is very important in fields where errors are more likely to result in catastrophe. For designers, evaluation would be important to reassure customers and reveal room or need for specific improvement, or where e-courses' strengths lie. One participant stated that despite reasons to evaluate, some may not be interested. They meant some would be satisfied with simply assuming that implementations work, and their investments are not in vain. Another participant argued that those who invest in e-courses want to be sure that it will result in skill or knowledge development that would last over time. This could provide an incentive to evaluate, but our model is not equipped to evaluate how long course takers' learning might be retained. Only how well the e-course facilitates retention through its use of facilitators. Hence, we did not try to implement this as a focus, as it would require changes to the evaluation approach.

4.3. Iteration Two

Iteration Two (see Appendix V) was entirely redesigned based on the previous iteration's feedback, retaining very little content from Iteration Zero or One, even though it was still based on the same theory. It was restructured and shortened in order to be more understandable, easier to read and less overwhelming. Page numbers were added, and each step's headline was given a designated color to make them stand out as individual steps.

We decided to incorporate a limited focus on design guidelines as well, as this seemed to be an avenue of development the participants encouraged.

The introduction consisted of one page. It prefaced what the model is and why we are developing it. We included a rough estimation of how long an evaluation would take, and a definition of the model's target group. A definition of e-courses was also included in order to specify what our model aims to evaluate. Lastly, we explained that we would include examples as we saw fit, instead of using one example throughout. Our new illustrations included clearer descriptions of the model's steps and result interpretation, and attempted to

highlight how design and evaluation are based on the same principles. The Venn diagram was altered to be easier to read, and re-colored to be consistent with the other illustration.

Our guidelines for goal identification mostly remained the same. However, we chose to add specific guidelines for goal making, where we stressed the importance of aligning them with purpose, organizational strategy and intent. We attempted to improve upon these guidelines according to the feedback on Iteration One. Due to time constraints, relatively little time was dedicated to this, specifically. Considering the nuances of goal making, we used literature we had available, and prior knowledge and sources. This means that the content on goal making was based primarily on classroom pedagogy (Engelsen, 2015; Woolfolk, 2014).

For Step 2, we explain that it is difficult to say how many facilitators a course would need to be "sound." We affirm that a course ought to use several and complementing facilitators, and that the amount itself would depend on the scope of the course. The table was categorized, the formatting was changed, and humor was removed from the table. We categorized according to what role facilitators play in e-course design, as previously described, and tried to make these categories intuitive for the model's user.

Step 3 was made to include instructions on how to use analytics to triangulate survey data. Our knowledge of analytics and time to research it was limited, hence we relied mostly on the Iteration One feedback when creating this section. The survey is intended to indicate the course takers' level of understanding (U), perceived achievement (A) and experienced facilitation (F). This way the survey is meant to capture data on all major factors used to determine if an e-course is pedagogically sound when triangulating and interpreting results. We explain that ideal results would indicate what is stated in the middle overlap of the included Venn diagram. If results indicate that either U, F or A are lacking, then the evaluation results would be placed in other sections of the diagram. We consider it likely that many courses will not obtain ideal results. We argued that if a course lands in an overlap, that course may not need to be discarded but rather requires or could benefit from adjustment. We removed the reference list, as it served no apparent purpose.

The illustrations below were included in the introduction of the Iteration Two package:

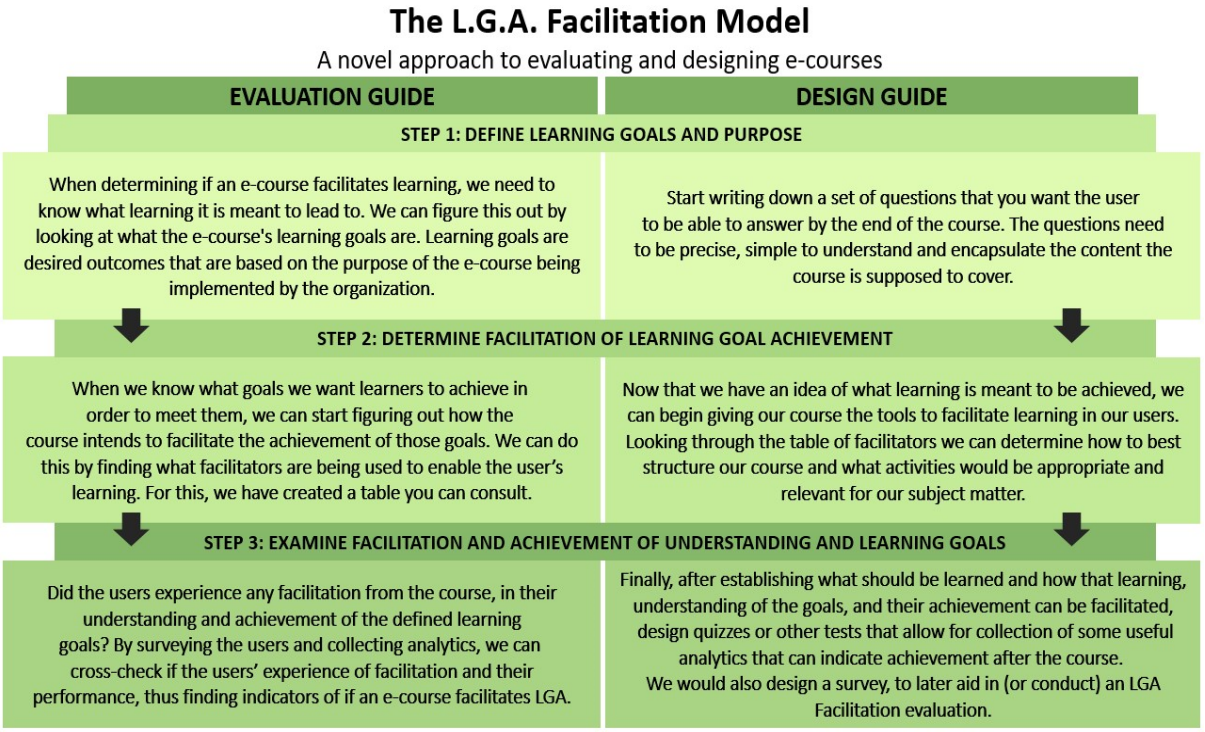


Figure 5. Illustration of the LGA Facilitation model for Iteration Two

Figure 6. Venn diagram now used for result interpretation in Iteration Two

4.2.2. Analysis and use of feedback

This section will present notable results that influenced our final iteration, the prototype, and how it was applied. The feedback will be presented according to our categorizations, as done when presenting the Iteration One's results. Again, only the feedback we considered most interesting to consider and apply will be presented, according to the coded categories; *Content and execution of steps*; *Design and presentation*; *Communication*; *Feasibility and use*; and *User group and features.*

"Content and execution of steps"

Which proposed developments or criticisms the participants provided, specific to the individual steps and content in the model.

Step 1

All participants seemed to agree that learning goals are important when designing and evaluating e-courses, due to their significance for the course's content. The importance of reflecting on why the e-course is being implemented, and what it should contain, was recognized as two of the most important roles of learning goals. There was also agreement among participants about how the model's focus on learning goals would be helpful for teams working on their definition and creation. 5 out of 10 participants stressed the importance of collaboration, ideally among individuals with diverse and relevant skills, to ensure the quality and appropriateness of goals. Two participants specifically stressed the value of expert involvement as early in the process as possible, as consultants on aspects such as pedagogical and subject matter related issues.

Two participants with jobs involving the creation of learning goals gave harmonious feedback on the model's guidelines, noting that the most common method of goal-setting is through learning verbs. One participant emphasized the usefulness of Bloom's Taxonomy when making goals and content. This aligned with the statements regarding use of learning verbs. Hence, we researched Bloom's Taxonomy in order to assess its usefulness for the prototype, and partially implemented it in order to increase focus on learning verbs. One participant also

suggested designing and implementing a method of testing the quality of learning goals in the model. Although we considered the concept interesting and relevant, we did not prioritize this due to time constraints.

Most participants agreed that we defined the implications of organizational contexts better than before, as only one participant still thought it was too vague. This participant argued that if an e-course is being implemented, its learning goals need to be directly and clearly tied to the organization's overarching goals. This would ensure that the e-course serves a specific purpose and benefits the organization in some way. We incorporated this rationale into Step 1 of our prototype, encouraging evaluators to reflect on why the e-course was implemented and if it serves its purpose appropriately. Another participant underlined that learning goals should be tied to overarching organizational goals in a way that makes their connection clear for the learner. This was also considered during the design phase of prototype development. We will explain how specific feedback was used when we explain our design rationale for the prototype.

Step 2

The participants approved of our changes to the presentation and format of the table, as it was easier to understand, the content was shortened further, and the language was clearer. 3 out of 10 participants thought the table could use more examples, and that some facilitators could be well exemplified using pictures. We decided against adding more facilitators or illustrations, primarily due to time limitations, but consider this for future development.

The categorization of facilitators was received as sensible, and participants did not have any objections or suggestions for how it might be categorized differently. It was fortunate that we discovered during interviews, when discussing the table, that some participants did not notice that categorization was implemented (in the interviews we confirmed that two participants did not notice the categories). That led us to the conclusion that we ought to highlight and distinguish the different categories.

Most, if not all, participants agreed that the facilitator table could work very well as a creative supplement during e-course design. Three participants stated it explicitly, elaborating on the table’s usefulness. The table was suggested to serve as a potential source of inspiration and guidance for facilitator use, among inexperienced and experienced designers alike, as both an

overview and a tool. Feedback on this topic indicated that the model would benefit from having guidelines that could highlight complementary facilitators. Exemplifying what contexts certain facilitators might be most effective in, would also be useful in this regard.

We were also encouraged to emphasize the potential benefits of using facilitators that engage several facets of how people learn, as they can be more effective for learning (similarly to statements from round one, regarding some facilitators being more complex and effective than others). An argument that was made concerned how activities that only concern e.g. memorization would arguably be less effective than ones consisting of a combination of complex tasks.

One participant criticized our statement regarding what a sound number of facilitators might be, as a rule of thumb within their practice was not to exceed five activities in an e-course. Overuse of activities is an example of what we would claim to be dysfunctional use of facilitators. The reason for this limit was to prevent users from finding the e-course bothersome or overwhelming. We realized this concern was relevant for the learning activities described in our table, as we had not considered in depth the potential problem of overusing activities. Hence, we found it appropriate to instruct evaluators/designers to be conscious in their choices of activities and facilitators in general. Warning them against overwhelming or otherwise disrupting the e-course takers' learning.

Step 3

The feedback received on this step was the most varied and rich, and once more it made up a bigger portion of our data than the previous steps. Step 3 was perceived by 5 out of 10 participants as still being quite confusing and challenging. 3 out of 10 participants argued that teamwork during the step's execution might make it more manageable, but that it ought to be possible to do alone. For Step 3 to be less overwhelming we moved the process of survey design to Step 2, when designing the prototype. The survey's content could then be designed while facilitators were identified in the course, making the process smoother. We reckoned it would make sense to move it there, also as a parallel to the design of, use, or identification of facilitators.

3 out of 10 participants explicitly stated that the survey format was reasonable, and that triangulating the survey results with analytics could yield useful evaluation results. No

participants stated or indicated that data triangulation would be a bad idea, as long as the data being used for the triangulation was reasonably sound, reliable and ethical.

Two participants explicitly stated that they were confused by how the survey template's content was formulated, as they did not understand how to use it to formulate specific content in an understandable manner. Among those who found the template confusing, the included example was considered helpful. The problem seemed to stem from their differences in use of language and specifics. This made it clear that the template needed to be reformulated in a way that allowed for easier interpretation of its intended use.

4 out of 10 participants argued that most people are tired of taking surveys, which could pose a problem if e-course users are unwilling to complete the evaluation survey. Two participants went as far as to claim that the Norwegian society is experiencing "survey-fatigue". Presumably due to banks, grocery stores, dentists and other services requesting customer satisfaction feedback. We interpreted this as an indication that the survey's questions or statements should not be too complex, and not exceed a certain number of questions, in order to keep the survey as simple and time-efficient as possible. The need for the survey instructions to be simplified even more was difficult to accommodate. Instead, we focused on improving the instructions within the prototype's template for survey design.

There was disagreement among participants when it came to the potential use of open questions in the survey design. 3 out of 10 participants argued that open questions could yield more valuable answers, because evaluators could receive richer data. Two participants meant this would fatigue and deter users further, arguing that users are not likely to be enthusiastic about completing a survey anyway. We discussed possible solutions for increasing the amount of useful data evaluators might collect. One way to do this might be to encourage users to reflect before, during and/or after taking a course, and provide feedback accordingly. Hence, their submitted data might be more rich and/or reliable. We also discussed with two participants whether this kind of prompted reflection over time could benefit the users' learning as well. However, this also seemed unlikely to yield sufficient responses, so we set the idea aside.

Two participants explicitly expressed concern over the issues of what analytics to use, how to use them, and how to get them. Evaluators' access to analytics would depend on the programs, platforms and systems being used, as well as what tests or tasks the e-courses might include. It seems reasonable to assume that different evaluators may have very

different analytics available. Hence, it is difficult to determine or assume what kind of analytics those might be, as well as how and whether they might be useful. The usefulness of analytics could be limited or void if evaluators do not have access to reliable and relevant data that indicates understanding, facilitation and achievement of learning goals. We took this into consideration when implementing instructions for use of analytics, data and result interpretation in the prototype.

4 out of 10 participants problematized our lack of specific instructions regarding how to interpret results, after triangulating survey data and available analytics. This included issues surrounding how the Venn diagram was meant to be applied in practice in order to evaluate the e-course in total. One participant pointed out that we should not give evaluators the impression that *one*, or only a few, survey takers' positive experience with a facilitator would be enough for it to be considered sound. The participants also seemed to agree that we needed to further specify our analytics and data analysis guidelines, how/why results may be considered sound, clarify the Venn diagrams' role and highlight the ideal result.

Design guidelines in the model

We were made aware that the design guidelines we included were not clear. They were not separate enough from the rest of the evaluation-focused text to clearly stand out as content or guidelines intended for design. Furthermore, we were encouraged to emphasize the importance of teamwork during the design of e-courses. It was stressed that a competent design team consists of experts with different competencies and backgrounds that are relevant to the design of an e-course's learning goals as well as content. These are all points that influenced how we created and implemented design guidelines, as a separate "path" and model of execution from the evaluation guide, within the prototype.

We were also encouraged by one participant to use "more crazy facilitators" during design. In this way, the designers would be prompted to be more involved and daring in their use of facilitators when creating activities or formatting interactive content. This participant also seemed to want us to do something similar in our own model, in order to make it more interesting, encouraging us to use our "gaming competence" from playing video games as a hobby.

One participant stressed the fact that quizzes have a somewhat bad reputation, which is undeservedly applied to quizzes that are well designed. The quality of quizzes should be underlined as important when designing and including them in e-courses, because they can serve as useful indicators of achievement. Addressing this, and implementing design guidelines specifically to aid designers in their development of sound and relevant quizzes, was recommended. Including such guidelines in the prototype was yet another suggestion we could not prioritize, due to time and the limitations of the prototype's scope. However, we keep this recommendation in mind for further development, as we find it relevant to provide pedagogical guidance on this issue.

3 out of 10 participants also stressed that following up e-courses with supplementary information and materials is beneficial and should be implemented whenever possible. Hence, we considered adding encouragement of follow up in the prototype, as a facilitator that would extend past the course itself. We decided against this because it would introduce another category of facilitators in the table, making the model longer and more packed with content (similarly to how we considered the facilitating impact of follow up when designing Iteration Two). This would also require further research we could not afford spending sufficient time on. Another issue we considered was that the inclusion of guidelines for follow up would mean that further evaluation guidelines would have to be added as well. We believe it would be more appropriate to design a separate model for guidance on the design and evaluation of e-course follow up interventions.

"Design and presentation"

What issues the participants had with interpretation of the illustrations, and the visual formatting of the contents or text.

The participants largely agreed that the illustrations had improved, but the use of color rendered confusion for three participants due to the similarity in their hues. One participant disliked the choice of using green colors. Another helpfully pointed out that our illustrations' ease of reading could be improved by removing excessive use of capitalized letters, *italics* and **bold** text. Left-adjusting the text was also recommended, as this participant had learned this made reading more intuitively easy for the eyes due to our habit of reading from left to right. Another piece of advice they gave was that "space is not your enemy". The reader

should not be overwhelmed by dense text, but rather have space to breathe while they are reading.

We were also encouraged by 3 out of 10 participants to add various illustrations of different steps or features in the model, such as using illustrations to exemplify facilitators. This would involve a considerable amount of work, and extend the model further, so we put this idea aside. Still, during our design of the prototype we attempted to make it more visually interesting, using illustrations more actively.

The participant who repeatedly encouraged us to make the model more interactive and exciting to engage with, by e.g. using game-like elements, made us reflect on how to do so. To make sure we understood what they might mean by this, we suggested that the model might be put into an interactive online format in order to be more engaging. This seemed to be an appropriate suggestion, hence we held on to the idea and proceeded to have it verified by all participants as appropriate and interesting. The idea is thereby highly prioritized among our considerations for further work, as it was highly approved of and might allow for many improvements. Such a format might provide not only a more engaging, varied and interactive design presentation, but could also allow us to gauge engagement through analytics and add new features. We kept this in mind when designing the prototype although we considered making it a website or otherwise interactive digital tool to be outside our scope of possibility. Instead, we decided to "simulate" a more engaging and potentially interactive format. We will present the design rationale behind our attempts to do so visually, in the subsection following the prototype's presentation.

"Communication"

What problems the participants identified when analyzing the structure, examples and language.

We were commended for successfully simplifying content from iteration One, 3 out of 10 participants admitted to skim reading. Two also admitted that the document still required some effort to understand. However, 8 out of 10 participants admitted to liking the content all the same. The content needed further simplification in order to be easily understood, but we were warned not to oversimplify it. A participant explained that we needed to strike a fine balance in order to make the model useful for both experts and novices within the target

group. It should not be simplified to the extent that it would no longer be anchored to any theoretical framework, or might make it easier for participants to apply the model uncritically. We have attempted to find such a balance in the prototype. By using clearer language and summarizing refined content from Iteration Two, its content's substance and communication is meant to be easily read and understood. We tried to make it easy to use for novices, but still encourage experts to reflect and use the model, while also leaving little room for uncertainty of the purpose of the steps and instructions.

Our use of examples was overall considered to have improved although, as mentioned, more illustrated examples were desired throughout the model. Where we considered it appropriate, such as when new content in the steps was included, new examples were added in the prototype. Steps were recommended to be broken down into more specific instructions and key points, as those were considered helpful. Hence, the prototype's steps contain only brief, separate sections and short paragraphs of text, often only consisting of a few sentences at a time. We chose to format the text this way to have its key takeaways stand out, fit into the visual format of the model, and to prevent the text from being too dense. Specific terms related to the steps' purposes and key points were also highlighted within the text, to clearly communicate their importance when applying the guidelines in practice. Despite the advice to not use **boldface** text too much in our illustrations, we considered it useful for pointing out the key content within the model.

"Feasibility and use"

What suggestions the participants made to improve user friendliness, interaction with the model, or probability of use.

We were told that if we were to include a separate design guide within the model, then it ought to have its own interactive interface for designers to use. This could make navigating and using the content more intuitive. Furthermore, all participants agreed that the content ought to be presented in an interesting way that deviated from the "typical student essay" or "academic paper" format, if it was to be considered attractive to read and use. Instead, we should try to format our content according to how it may look as an interface. 8 out of 10 participants argued that the most important developments before pilot-testing the model would be to improve its presentation, for it to be viewed as more attractive and hence more

feasible for use in practice. Once its presentation was improved and the content was somewhat refined (especially within Step 3), the participants agreed it could even be ready for use. In order to figure out what features a potential interface should have, the participants generally agreed that pilot-testing the model would prove helpful. This would require us to create a new (presumably temporary) form of presentation in the meantime.

"User group and features"

Who the participants believed the model might benefit, where, as well as what might improve upon the possibilities and options of use.

All participants agreed that it was now clearer who the target group was. Two participants brought up that the target group may not always be enabled to evaluate. To what extent employers (of the target group) choose to prioritize evaluation, would depend on whether or not they saw the value of it being conducted, and understood what it entailed.

We dropped trying to incorporate the use of incentives in the model. One of the main reasons was that we can do little to influence the use of incentives by the target groups' management. The idea of creating quality assurance stamps was also discarded, after a participant pointed out that we lack the authority to issue such stamps. Hence, we thought the biggest improvement we could make to the model's feasibility would be to make it as simple, short and attractive as possible, 8 out of 10 participants thought this was a good idea. Making it easy to present and explain was also underlined as an important priority in this regard. Creating a "one-pager" sheet where the model could be summed up in one page was recommended, to allow the target group to explain it simply to their employers. This could enable the organization to see its value, potentially increasing focus on evaluation and allowing the target group to be granted resources to conduct the evaluation.

4.2.2.1. Visual presentation of the prototype

As previously stressed in several contexts, the participants emphasized the importance of how the model ought to be presented visually, structurally, and interactively. We welcomed these suggestions, while also being positive to the idea of it being more interactive. This led to the idea of developing the model as an online web-page. 8 out of 10 participants expressed their

approval of this, as a potential avenue of development in future iterations, after the prototype's testing. As previously mentioned, this concept of an online model inspired the development of the visual format we made use of to present the prototype in this thesis.

We decided to imitate the interactivity of having online "paths" and prompts for the steps and their content, by designing the model as a PowerPoint presentation. Implementing visually distinct sections of text and separate guidelines, and integrated visual elements such as models. This way, we could visually format the prototype as it might be presented as interactive instructions, allowing for prompts and activity within the model. The table was also redesigned to fit this new format of presentation, while its content remained unchanged.

The participant who encouraged us to space out content, left-adjust the text, and avoid the use of several fonts and styles, also encouraged us to cut the content down to a third of what we started with. When designing the prototype we focused on drastic reduction of its content, in order to make everything as concise as possible within each step and corresponding slides.

We chose to use color consciously, matching the content within each step to the colors used in the introduction's illustrated model. Hence, we also changed the color of the Venn diagram to include hues of red, since it ought to correspond to Step 3, now presented in red within the illustrated model. We found this appropriate as a way to highlight the diagram's purpose, as it now visually belonged with the instructions for result interpretation. This manner of placement and color coding of content was also requested by a few participants. The categories within the Facilitator Table were also color coded, due to two participants admitting to not noticing the different categories implemented in Iteration Two. Our goal was for the model to retain its soundness, while its aesthetic deviated from more traditional academic formatting and presentation, making it more attractive to the user group.

4.4. Iteration Three – The Prototype

The following pages are images of the model, due to it being designed in PowerPoint allowing us to customize its visual presentation and formatting past the capabilities of Word and similar programs. It is made up of ca.3260 words, and we have decided to include it in its entirety due to the prototype being the main result our work has culminated in. It is also included as an appendix (see Appendix VI), due to our desire for the model alone to be easily accessible outside the main content of the thesis.

Workplace E-learning, does it Work?

A New Approach to Evaluating E-learning Courses with Implications for Design

The Learning Goal Achievement (LGA) Facilitation model is a prototype evaluation model, with implemented design guidelines.

The purpose of the model is to help designers and administrators of e-courses, as well as HR and pedagogues, to evaluate if an e-course facilitates the users' achievement of learning goals.

The model aims to ensure that an e-course is pedagogically sound. It is intended for both evaluation and design of e-courses, according to the same principles.

The evaluation process is the focus of the model, and is meant to be completed as instructed. A more comprehensive design guide may be developed in the future.

The design process is intended to be followed by an evaluation. Guidelines for design therefore transition into the evaluation guide.

The illustrated model summarizes what the evaluation and design guides involve.

We define e-courses as e-learning content presented as digital "courses," meant for training/learning of some kind, requiring the user to engage with it. Engagement may involve e.g. clicking through course pages or taking quizzes after a presentation of content.

E-courses may take many forms and be used to cover a wide range of topics (e.g. health and safety, leadership and teamwork.) Hence, our model is intended to be flexible in its application.

The LGA Facilitation Model

Evaluation guide	Design guidelines
Step 1: Define the Learning Goals and purpose of the course	
To see if an e-course is "pedagogically sound", we need to know what course takers are supposed to learn from it. To do that, we define its Learning Goals. Learning goals (LGs) are desired outcomes, based on the purpose of the course. Who the course takers are also matters. • If you see no obvious goals, you must ask someone who might know. • If no one knows, you should design LGs that fit the course as it is.	To make your e-course "pedagogically sound", and align with the purpose of it being made, you need to define Learning Goals (LGs). They need to be precise, easy to understand, and cover what the learner is supposed to get out of it. Here are some ways to do that: • Form questions you want the course taker to be able to answer, • use learning verbs to define what the user should be able to do, • or define what achievement of the course purpose looks like.
Step 2: Identify and use "facilitators" from the course to make a survey	
Once clear goals are defined, we examine how the e-course facilitates the achievement (A) of those goals. Does it enable the desired Learning Goal Achievement (LGA), by using pedagogically sound design? Go through the course and identify what "facilitators" it contains. To make that easier we have made a table of examples you can use. Once those are identified you create survey questions about them. We have included question-templates for survey design.	Once you have defined precise and relevant learning goals, decide on how to facilitate the course takers' Learning Goal Achievement (LGA). Decide on what types of "facilitators" you want to include in the course. Look to our table of examples for inspiration and information. Reflect on how they should fit together and cover the LGs, and then start forming survey questions about them. We have included survey question-templates.
Step 3: Survey course takers and triangulate your collected data	
To get results that indicate the e-course's pedagogical soudness, you need to "triangulate" three types of data. • You have collected the first data, your defined LGs and facilitators. • The next type will be survey data from the course takers, by using your questions from Step 2 about facilitators and relevant LGs. • Finally, you look at relevant "learning analytics" (if possible). Then use the included Venn diagram about Understanding, Facilitation and Achievement of LGs, to interpret your data and finish your evaluation.	After the e-course has been finished and completed by the course takers, it is important to follow up with an evaluation. Use your survey questions from Step 2, and make sure they are accurate. It is a bonus that the survey provides repetition for the course takers, which is beneficial for learning. (As long as the evaluation is relatively close to the course in time.) Follow the instructions in Step 3 in the Evaluation Guide to proceed.

Step 1 Define the learning goals and purpose of the course

Evaluation

To see if an e-course facilitates learning, it is necessary to know what learning the e-course is meant to lead to.

Learning goals are desired outcomes, based on the purpose of the e-course being used by the organization.

These prompts can help you **define what goals may be present** in an e-course:

- Does the e-course explicitly state any learning goals?
  - If so, are those goals **appropriate** or otherwise related to the **purpose** of the e-course?
- What overarching **purpose** does the e-course serve?
- Do you know who requested, designed, and/or administered this e-course?
  - What were their intended learning goals for this course (if any)?

If there are no goals, design your own for the purpose of the evaluation.

Purpose and Appropriateness:

- **Purpose**: How learning goals fit the organization's intent and strategy behind using the e-course. Overarching goals, regarding learning and competence development, should also align with the e-course.
- **Appropriateness**: For the target group to benefit from the course, the content must be relevant and understandable. Consulting your user group is a way of making sure learning goals are relevant and align with their current knowledge.

One way to **identify the purpose of a learning goal** is to ask " WHY?", and answer "BECAUSE." This lets you see how the course is linked to relevant strategies and goals. Consulting someone who knows and understands your organization's strategy and goals can ensure that your reasoning is accurate.

Example:
The learner should remember the company's ethical guidelines. WHY?
- BECAUSE it is meant to lead to more ethical practices. WHY?
- BECAUSE the company wants to encourage workers to be more aware of their work's ethical implications. WHY?
- BECAUSE the company has a zero corruption policy.

If no purpose is found, continue evaluating with this in mind.

Design

Guidelines for goal making:

Appropriate for design purposes, or if a goal cannot be identified.

- Learning goals should clearly state what the users are supposed to learn.
- They should clarify what achievement would look like.
- They need to be **appropriate** to the user group, and related to a **purpose.**

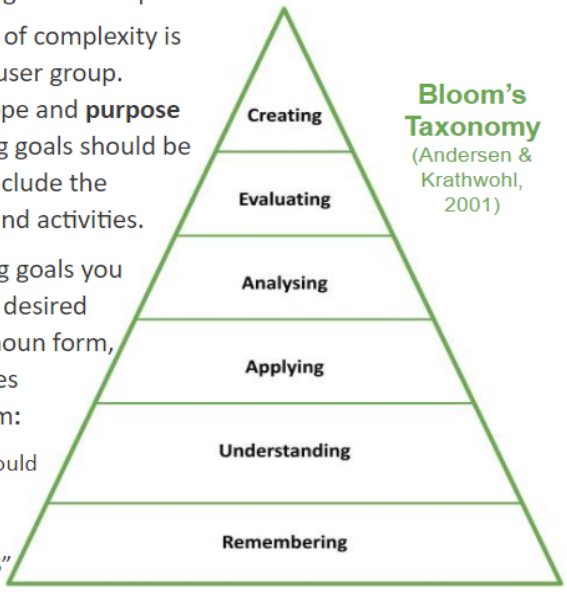
Learners should be encouraged to actively reflect on learning goals.

Learning goals can be categorized according to the complexity of the task needed to achieve them.
Looking at **Bloom's Taxonomy**, lower complexity acts as a prerequisite for higher complexity, meaning the learner needs a grasp of the basics before achieving more complex tasks.

Determine what level of complexity is **appropriate** for your user group. Depending on the scope and **purpose** of the course, learning goals should be suitably complex to include the appropriate content and activities.

When making learning goals you ought to describe the desired learning outcome in noun form, and with the objectives expressed in verb form:

- **E.G.** "The learner should UNDERSTAND and REMEMBER the ETHICAL GUIDELINES"



Bloom's Taxonomy (Andersen & Krathwohl, 2001)

Step 2 Identify and use "facilitators" from the course to make a survey

Evaluation

When the **learning goals** of the e-course have been defined, examine what the course does to facilitate achievement of those goals. Identify the **"facilitators"** the e-course possesses.

Facilitators are features, tasks, and activities or exercises, in the e-course. These may aid users of the course in their achievement of learning goals, if they are **pedagogically sound.**

The following table is meant to help you identify and define facilitators. They are categorized hierarchically in the table. "Structural" and "basic" facilitators are somewhat fundamental for the effectiveness of "activities".

Using the Facilitator table

Go through the course before looking at the table. Define the facilitators you perceived. If you are unsure, or are having trouble identifying or defining the facilitators, consult someone with expertise in learning or e-course design.

Survey

After identifying the facilitators, create a survey that may **indicate if the facilitators work**. This is meant to be used in Step 3, to examine the pedagogical soundness of the e-course.

Provided in the following slides is an **example template for survey design**. It provides guidance regarding the format and ways of specifically addressing the facilitators in the e-course.

Remember to make sure your survey is reliable, and to test it on a large part of the user group. Take your time, and cooperate with colleagues or other stakeholders to check the survey, if possible.

Design

By including facilitators you are creating a pedagogical framework for the presentation of learning goal-relevant content. It is important to consciously choose facilitators, and consider their **appropriateness** for your user group.

When choosing and designing facilitators, remain aware of what the facilitators' relevant **learning goals** and **purposes** are.

They should inform how you choose to structure the course and formulate content and activities.

You may also make use of the Facilitator table, to see what facilitators may be suitable for your e-course, or merely to gain inspiration.

For an e-course to be **pedagogically sound**, it must have sound facilitators, and preferably several compatible facilitators. However, users may feel overwhelmed if there are too many facilitators that require their engagement.

A rule of thumb is to stick to approximately **5 activities per course**.

Keep your use of language in mind. It must be **appropriate** for the user group, and **accurate to the learning goals**. Write only what is necessary, to precisely convey information the learners need, for them to **achieve the learning goals.**

Getting a second opinion or advice on choosing which facilitators to use is always a good idea, as it provides valuable feedback in the design process.

Make use of experts in relevant subject matters, and varied competence

- Although the table is meant to be easy to understand and read, it is still a good idea to consult someone with **pedagogical expertise**. They may be able to identify the various facilitators in a given e-course, and aid in the survey design, to **ensure reliability.**
- When designing e-courses, consulting relevant experts lets you double check if your included facilitators are **appropriate** for the user group, content and subject matter.
  Including experts from various fields in the design process can altogether improve the end product.

Step 2 Survey design

This is a template for survey format and statements. It allows users to submit their experience of both the **facilitation** of **understanding** and **achievement**, within one survey.

In other words; the format surveys the three major factors that can indicate a pedagogically sound course.

How much users **agree or disagree** (in total) should indicate how helpful a facilitator was, as well as how clear and relevant it was perceived to be.

Do not include or define learning goals in the survey. You want to know if the users understood the goals, without being reminded of them in the survey.

The e-course [included/consisted of] ... [facilitator as presented/functioning in the course]. 4

To what extent to you agree with the following statements?

(Example statements, to gauge the Facilitation of Understanding and Achievement of Learning Goals:)

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
"I found [this exercise/task/feature] helpful to my understanding of why I am taking the course."	○	○	○	○	○
"[This exercise / task / feature] was useful for my learning of [the subject matter]."	○	○	○	○	○

Example

An evaluator named **"Jim" has identified the use of mnemonics as a facilitator** in an e-course about fire extinguisher use. This facilitator is present in the form of an acronym, **"PASS"** (Pull, Aim, Squeeze, Sweep), as a way of making the information easier to recall.

The survey could be designed like the one presented to the right. He can use the template to **formulate statements to evaluate the facilitator by**.

The facilitator in question has to be specified according to the reason it is used. In this case, to aid in the memorization of content.

By including the acronym and addressing it without a reminder of its meaning, the users must recall it, if they can.

Define the facilitators accurately and formulate relevant statements. This is more important than it is to adhere strictly to the survey template.

In this course, an exercise in memorizing "P.A.S.S." was included.

To what extent do you agree with the following statements?

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I understood why I was supposed to do this exercise, and its purpose in the course.	○	○	○	○	○
This exercise helped me memorize "P.A.S.S.", and how to use it in practice.	○	○	○	○	○

Structure, content & language

5

Facilitators that focus on clear and concise ways of presenting content to the learner

Facilitator	Explanation	Example(s)
Narrative	Storytelling and narrative structure are used to formulate and present content. This provides context for the learner and each learning activity fits together in a cohesive way.	- Presenting a case or familiar situation the learner can recognize, relate to or inhabit. - Telling a story throughout the presentation of content.
Targeted content	The course contains content for a specialized target group, as opposed to being targeted to a wider audience. This type of content needs to be accurate but is more challenging to understand for individuals outside the specialized group. Precise and appropriate language and information must be useful and understandable to the target group.	- Course content meant (and made understandable) for groups with special skill sets and knowledge (like lawyers), as opposed to more general knowledge for the employees of the wider organization (like fire safety courses).
Sequenced instruction	Gradually providing learners with smaller pieces of information in a specific order, as to acquire a new skill or knowledge. Only allowing access to more content when the learner provides proof of possessing the prerequisites.	- Step-by-step instructions on how to navigate a website, use equipment safely, perform maintenance tasks, etc. - Structured slides in an order that does not allow for skipping slides or progressing without “completing” certain steps.

Basic facilitators

6

These are considered fundamental for structuring and enabling activities and other facilitators.

Facilitator	Explanation	Example(s)
Clear focus on learner outcome	Stating goals for the learner as to encourage them to reach for the desired outcome. Can motivate the learner, as it allows them to intentionally try and achieve goals. Provides context and meaning to the learning material presented in the course.	- Stating learning objectives at the beginning and end of the course. - Providing overviews that show progress in completing partial and main goals. - Providing reminders of the purpose of (or incentive behind) the course throughout its content.
Digital scaffolding	The learner is supported through prompts, encouragement, and guidance when in need of assistance, to achieve a certain goal or going through the content of an exercise. This is provided until they have developed the necessary skills/knowledge to go through the exercise alone.	- Automated feedback prompts that respond to learner input, providing guidance or aid when necessary or requested. - Avatars, integrated narrative/case prompts, etc. meant to provide relevant and specific aid in tasks.
Gamification	Content or activity presented in a "gamified" way to promote engagement and recall. The purpose would be to engage learners to learn through play and challenges related to the subject matter of the course.	Examples of gamified course features include immediate feedback and results, clear progression and reward systems, as well as aspects of narrative storytelling, role play, experimentation, creative problem solving, puzzles, quizzes, competition, etc.

Basic facilitators

Facilitator	Explanation	Example(s)
Multiple representations	Representing information in a varied manner (text, video, audio, illustration, etc.), allowing the learner to see the content in different ways, this can lead to a deeper understanding of the content. This can stimulate the learner and allows for a compact and varied method of presenting information.	Graphs, illustrations, simulations or other descriptive media that can be used together to describe various aspects or perspectives of the same, or similar, concepts.
Gradual steps	Presenting knowledge in an order that lets learners gradually build a deeper understanding and mastery of a topic. Requiring the learner to use what they learn about a topic to then understand new information about the same topic.	- Gradual increase in difficulty in a row of exercises, or e.g. game-like tasks with a narrative progression, where the tasks become more and more complicated.
Highlight Progression	Giving the learners a clear sense of progression. This can be done by rewarding the learners after completing objectives or informing the user how close to the end they might be.	- Using progression bars in the course. - Rewards or other acknowledgement that the user completed an objective or part of a course.
Positive OR Negative reinforcement	Rewarding the learner when they e.g. provide correct answers, to encourage them to continue to do so. **OR** Punishing the learner when they e.g. fail a task, to discourage them from continuing to do so. (It should be noted that rewards have been indicated to be more effective than punishments in most contexts.)	- Receiving immediate positive feedback upon providing a correct answer in an exercise or quiz, in the form of an achievement or prize. OR - Needing to start a task over again from scratch due to any error in its completion, and e.g. having their allowed number of attempts at the task reduced.

Activities

8

Facilitators that require or encourage active engagement with course content to reach goals.

Facilitator	Explanation	Example(s)
Experimentation	The learner is provided an opportunity by the course to create and test what they have learned, in a digital environment or simulation.	Learning through trial-error or exploration of specific problems, situations or concepts in simulation-based exercises, like in a video game or virtual science lab.
Repetition	Formulating content in different ways throughout the course to improve memory retention or repeating certain key lessons and facts to make sure the learner picks up on them and their importance.	- Repeatedly presenting important facts in a simple way, in different (but relevant) parts of the course. - Quizzes and tasks that allow the learner to practice/use what they have learned and/or make use of key resources they have access to.
Open answer problem solving	By giving the user room to make their own answers and solutions, without being presented options to choose from, the learner is encouraged to produce answers using the knowledge they already have.	Avoiding multiple choice and instead allowing for free-text answers in e.g. quizzes or for questions with no “correct” answers.
Discussion	By providing a space for learners to share feelings, thoughts and ideas, you facilitate and encourage interaction between learners. This encourages knowledge-sharing, and enables peers to both learn from the course and each other.	Setting up a space for comments and discussion in the course’s platform/program, or in a social media platform where the course is integrated or accessible.

Activities

Facilitator	Explanation	Example(s)
Mnemonics	Information presented in the form of rhyme, acronyms or verse to make repetition and recall easier.	- Rhyme and verse like songs for remembering the ABCs. - Acronyms like PASS (Pull, aim, squeeze and sweep) for fire extinguisher use.
Roleplay	Learners engage with each other in real time in a provided fictional situation. This provides a space to practice and use what they have learned in different ways. The learner can also be assigned a "role", where they need to complete tasks alone according to the role.	This can e.g. occur via games and individual tasks, or by collaboration using communication programs, where you can give learners roles and a "scene" to simulate various scenarios, e.g. handling emergency or social situations, scenarios for practicing leadership or counselling skills, etc.
Portfolio creation and sharing	By making portfolios learners can construct and organize knowledge. These can be shared, revisited, updated and/or used to track progression. These can function as key event logs for personal/professional development.	Event logs, personal development planning, digital "mood boards" or "clip boards" and other tools for collecting and organizing material.
Collaborative problem solving	Learners form groups or teams for the sake of solving a problem or making a product (like a presentation). Collaborative work needs a "space" the learners can use as a platform. It enables complex problem solving through knowledge and skill sharing that is unavailable when working alone.	- Forums and discussion boards, digital meetings, roleplaying a scenario requiring e.g. teamwork or social skills. - Constructing buildings together in Minecraft and similar multiplayer games that may be relevant

Step 3 Survey course takers and triangulate collected data

Evaluation

Data and survey results must be interpreted in order to achieve an evaluation result that indicates how **pedagogically sound** an e-course is.

Three forms of data should be triangulated, if possible.

- First, **survey your course takers**, using the findings and template in Step 2.
- If **analytics** are available, see the information below about using them.
  - They may allow for "cross-checking" e.g. if survey data about facilitation align with analytic data about achievement.
- All evaluation and design work in **previous steps** should be taken into consideration, when **interpreting data.**

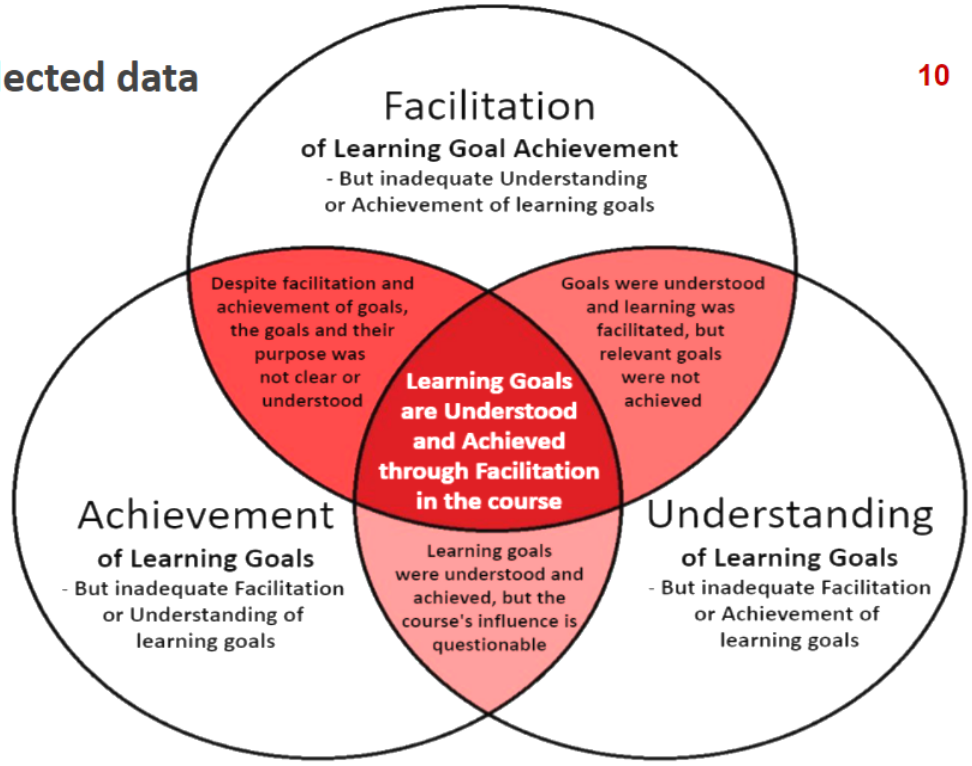
Design

Before the course is put to use, implement relevant tools, tasks, tests, or other ways to **gain relevant analytics.**

The analytics must relate to the learning goals, facilitation of achievement, and provide data that will help you when you evaluate.

Evaluation allows for insurance of **pedagogical soundness,** as well as discovery of potential room for improvement, or need for follow-up.

Follow the evaluation guidelines, and **interpret results** accordingly.



Analytics

Analytics should indicate **understanding, facilitation and achievement** of the learning goals, while being reliable and accurate in their measurements.

Examples of potentially useful analytics: Activity data over time, quiz results and number of attempts, amount of completed voluntary tasks, progress overviews, or drop-out rates.

All data that concerns the users, must be collected and used according to the General Data Protection Regulations (GDPR).

Triangulating several types of analytics with the survey data, and documented work from previous steps, can aid when interpreting results. However, do use them consciously.

Diagram for Result Interpretation

The interpretation of results must be done according to the individual reasoning of the evaluator(s), as practices and results may vary widely in different contexts.

If all data implies that **the majority of users** experienced sound facilitation **(F)**, and understood **(U)** and achieved **(A)** the learning goals, this the ideal result in the middle section of the diagram. This indicates **the facilitation of LGA was successful**, and the e-course is **pedagogically sound.**

If a set of data is missing indications of **F**, **U**, **A**, or several of these factors, that means the corresponding results would land elsewhere in the diagram. Such results indicate that the course is not satisfyingly pedagogically sound, due to the lack of overlap.

Example: If your results indicate **F** and **A**, but no **U**, the results would fit in the F and A overlap in the diagram. The course may e.g. have failed to communicate its goals and purpose, or its goals do not align with any relevant purpose. This does not mean the course should be discarded, but rather that there is room for improvement in the relevant areas.

4.4.1. Design rationale

In this subchapter our design choices will be explained step-by-step, in order to present our design rationale for the prototype's content and major changes in presentation. The explanations will be based on the changes made to the model after Iteration Two, when using the feedback data we collected. What feedback we decided to use, and how we did so, was outlined in the previous subchapters. This section will detail our reflections and reasoning behind specific design choices of aesthetic presentation and content, past the reporting of data that impacted the design.

Step 1

Bloom's Taxonomy was appropriated for use in the design guidelines of Step 1, in order to include more theoretically robust goal making guidelines, that included the formulation of learning goals by use of verbs. Bloom's taxonomy was designed to aid teachers in creating learning objectives for their students (Wineburg & Shchneider, 2010 ; Aqil, & Callaghan-Koru, 2020). It hierarchically categorizes the cognitive processes required to complete tasks, where the lower ranked processes act as prerequisites for the higher ranked processes. Teachers may use the taxonomy to aid their students "climb up the pyramid," by designing learning activities that encourage learners to reach for mastery over increasingly complex tasks (Airasian, Anderson, Cruikshank, Krathwohl, Mayer, Pintrich, Raths, Wittrock, 2001 ; Krathwohl, 2002 ; Bertucio, 2017). It was designed in the 50s, but has since been redesigned several times, to more appropriately fit modern paradigms (Airasian et.al, 2001; Bertucio, 2017; Forehand, 2010). It serves our model well because it further highlights that learning may take many forms. However, it has been criticized for encouraging teachers to prioritize the cognitive side of learning at the cost of the learner's social needs (Bertucio, 2017).

The taxonomy uses "action verbs" to design learning goals; where verbs signify a learning activity, and the noun signifies what the student should learn (Airasian et.al, 2001 ; Krathwohl, 2002). Its implementation in the model is intended to provide the user something tangible to work with when making learning goals. Time restraints necessitated a simplified version of the taxonomy, yet we would argue that it is enough for the users to potentially find

it helpful. Admittedly, with more time and designated space in the model, we would have liked to research the taxonomy further and make its application in the model more robust.

We also appropriated and adapted a method one of our participants shared with us, intended to help learners tie learning goals in e-courses to wider goals and strategies. This participant would prompt learners to reflect on the learning goals' relationship to their relevant organizational strategies by asking "so that..?". This would prompt a chain of answers in the form of increasingly specific definitions of the intents and purposes for the e-course, in context of the organization's goals. We took inspiration from this method by incorporating questions intended to achieve the same results "WHY?" and "BECAUSE....". This was included because it underlines the vital role learning goals play in determining if an e-course has any tangible overarching purpose. Potentially, it may also aid evaluators in determining if it needs to be amended or was a worthwhile investment, due to its failure to facilitate the achievement of intended learning goals.

We added visually separated sections dedicated to the encouragement of using teamwork early in the evaluation or design process, because it was strongly emphasized in our feedback. 7 out of 12 participants reported that they would prefer to work in teams when conducting the evaluation, or underway while designing e-courses. The reasoning was that the demands of individual steps seemed great enough that the evaluators would need help at some point. The emphasis on teamwork was consistent with our conceptual framework of knowledge creation, and so it seemed appropriate to emphasize that within the model as well.

Step 2

We specified that there is a limit to how many activities a course should have before they might become counterproductive to the facilitation of the user's learning. This was based on feedback from one of our participants, who also stressed that a course does not become sound merely from adding lots of activities or facilitators, as it is possible to tire and overwhelm the learner. This also specifies what dysfunctional use of facilitators can look like, more clearly than in feedback on earlier iterations.

Since survey design requires the evaluator to identify, define and re-formulate the use of facilitators to create questions for the survey, we thought it was appropriate to include this

process in Step 2. Another reason for its relocation was due to 5 out of 12 participants reporting that Step 3 looked overwhelming.

We rewrote the template content completely because how it was supposed to be filled out was unclear. It was purely intended to offer a basic suggestion, which is then meant to be adapted and customized. Therefore, we reformulated the template and tried to clearly differentiate the template and example when we presented the guidelines for survey design. Furthermore we emphasized the need for surveys to be well-formulated, and customized according to the evaluator's needs. Survey results would not be useful unless the evaluator considers what data they seek to gather from their sample, and how they would do so by specifically addressing e-courses' content.

The facilitator table is color coded according to the categories, and we wanted to give each section of the table enough space for them to be read comfortably. To do so we split the longer categories that contained the most facilitators into two slides each.

Step 3

Considering all the ways one can collect and use analytics, it seemed overwhelming for us to create sound guidelines for use of various analytics in a myriad of contexts. Hence, we chose to abandon our ambition to address the participants' request for specific instructions and information on analytics. Seeing as the participants overwhelmingly agreed that using analytics to triangulate survey results was a good idea, we chose to make the instructions somewhat flexible. We rather attempted to enable the evaluators and designers to make informed, independent choices, instead of providing specific guidelines. Encouraging evaluators to use analytics they had access to in a responsible way (assuming the analytics are accurate, appropriate and valid) seemed sensible as a rough guideline. This means the model leaves room for the evaluator to decide how to best use analytics, within their individual contexts and limitations.

We wanted to clarify the instructions for result interpretation, because this seemed to be the most demanding task for the evaluator. This seemed to be because it required a great deal of independent reflection and conclusions. However, we concluded that this final part of the evaluation would need to be vague and flexible enough to be used by its entire target group. Their contexts, practices, levels of skill, access to resources and analytics, and possibilities of

cooperation could vary wildly, requiring independent decisions by each evaluator or designer. We did attempt to avoid confusion by simplifying the language and indicators of sound results, and presenting the Venn diagram along with the instructions. We also attempted to clearly explain that this process would look different for individual evaluators, depending on all the aforementioned factors, and probably more.

4.5. Reflections on the empirical findings

In this section we will share our reflections on our findings, primarily focusing on the participants' reactions to Iteration Two. We consider the general reception of that iteration to be of interest due to their implications for the prototype. We will also discuss the most critical participant's significant deviation from the norm. Lastly, we will explain how we interpret the findings in light of our theoretical framework. Based on our feedback, we will therefore argue that our model has the potential to improve evaluation practices. All of our participants agreed that the model could be useful within their field. They said primarily that it would be a useful source of inspiration for making guidelines and using facilitators, and a helpful tool for quality assurance and group work. After receiving the feedback on Iteration Two, we were left with the impression that it was received with a great deal of positivity, interest, enthusiasm and constructive advice. The most common positive and encouraging types of feedback we collected is presented here:

- All expressed interest and/or approval of the evaluation approach, and focus on pedagogical soundness and goals, except the most critical participant.
- The addition of design guidelines parallel to the evaluation approach was well received and considered useful in several ways.
- The facilitator table was highly appreciated for several reasons (such as for inspiration, guidance, discussion, serving as a form of checklist, etc.)
- Positive feedback from 8 out of the total of 12 participants regarding its potential and/or readiness for testing and use.
- Approval of the triangulation method of survey data and analytics, with the prerequisite that data and analytics would be reliable and relevant (and that guidelines in the model are further improved).
- Encouragement to continue our research and development of the model, either through PhD research or (as two participants suggested) a start-up business.

- Enthusiasm for increased awareness of pedagogical evaluation, goals and design was generally expressed as a desired consequence of this kind of research.
- Approval of the changes we made in the model's language, presentation and structure.
- The survey concept, template and/or example was also met with approval by all except the most critical participant.
- The illustrations were well received as generally understandable and useful, with two exceptions.

In both rounds of data collection, the critical participant's feedback was influenced by their expectations and interpretation of the model and its theoretical framework. They expected the model to evaluate in a similar fashion to the Kirkpatrick or ROI model. The evaluation results they perceived to be desired by e-learning companies and their customers, were indications of behavioral change and profit as a result of the course. Due to these expectations, they expressed their disappointment and firmly disagreed with the model's overall concept. They suggested that the best way of evaluating e-courses is by measuring change in behavior before and after the e-course, and did not consider an interview necessary to elaborate on their survey response during round two. However, the critical participant also provided positive feedback regarding how the model might be reassuring for e-course customers; it might be useful during course development; it could measure learner satisfaction; the content was understandable; and instructions were clear. The critical informant also indicated that the facilitator table might be useful, though they disagreed with its purpose in the model

Another participant explained one of their methods of checking whether a learning implementation worked in their organization, by looking for a change in behavior that corresponded to the learning implementation. This participant also mentioned that they were in frequent contact with others in the industry who admitted to using the same perspective. This could indicate that the most critical participant's perspectives are more common within the target group than within our selection of participants, as we suspected might be the case. Lastly, this participant admitted to believing that there would be no way of knowing how, or where, the learning actually came from, and that a new approach might be a good idea.

5. Findings and discussion

In this chapter we will reflect on empirical findings; there are findings that did not directly influence our design choices, but we consider them important for reflecting on the design process. Explaining how we believe our model may function in light of the theory we consider relevant to the feedback. Furthermore, the relevance and results of the prototype will be discussed. The prototype's internal and external validity will also be discussed. Our empirical data and design based choices will be central in this discussion, along with how certain findings reflect potential issues and/or strengths of validity. Finally we present our rationale regarding the prototype's implications for future research and ambitions for pilot testing.

Our final result, the LGA Facilitation Model is a prototype evaluation model ready to be tested in an organizational setting. It was designed in a short amount of time (18 weeks/4 months), through several iterations of DBR. According to our empirical findings, as well as experiences from speaking with academics and experts in the field, it fits with similar developments in the field. However, contemporary e-learning research has not yet (to the best of our knowledge) produced any similar evaluation models. Therefore, the model seems to be viewed as an attractive option to existing evaluation models. It was viewed by our informants as simple to understand and presumably execute, when supported by a design guide as well as an evaluation guide. Furthermore, it is based on pedagogical theory and principles, and seemingly flexible enough for use in organizational settings and e-courses.

Our evaluation model consists of smaller steps, and with more clearly defined purposes and sub-processes. This was accomplished by having the steps of the evaluation target the learning implementation itself, instead of trying to measure the learning it results in. The general scope of each step aims to be less demanding for the evaluator, while at the same time bringing in a measure of flexibility as part of the instructions. The reasoning for our choices is that an evaluation model would be better suited for evaluating e-courses if it was developed for the specific purpose of doing so, not based on the evaluation methods of in-person training implementations.

5.1. Discussion of results and relevance

If we decided to view the e-course as an object of explicit knowledge, then it would be reasonable to say that the user-course interaction occurs within processes of Internalization in Exercising *ba* (Nonaka et al, 2000). This would after all be the primary purpose of an e-course; to help the user develop their tacit knowledge by using the explicit knowledge in the course. If the learner finds no use for the e-course, it becomes easy to say that the e-learning implementation needs to be adjusted or supplemented. To ensure that related learning implementations and follow up of the e-course are relevant, course designers should work with other experts to align these implementations. This could be viewed as a process of transforming relevant tacit knowledge into explicit knowledge for dissemination and integration into practice (Nonaka et.al, 2000). Such a process would begin by building a team, agreeing on a plan of action, creating learning material, before finally implementing it. Evaluations would unfold in a similar way; by building a team; agreeing on how to conduct the evaluation; surveying course takers before then looking at how, and if, explicit course knowledge was made tacit and integrated into practice.

We would argue that our model fits as a boundary object, into this process of knowledge creation (Star, 1989; Carlile 2004; Carlile 2002). These are objects that can be shared across contexts for the sake of addressing or solving problems (Star, 1989 ; Carlie 2002). Carlile (2002; 2004) explains that these objects can be used in different approaches to address problems of varying complexity. *Syntactic approaches* refers to using objects to create a shared language and vocabulary. *Semantic approaches* refer to using objects to create a shared understanding in practice. *Pragmatic approaches* refer to using objects to change or overhaul existing knowledge (Carlile, 2004; Carlile, 2002). The model could aid in bridging competence gaps between individual team members with different competencies. This is something our participants noted; the model could be useful for spanning syntactic barriers when designers explain their design process to a customer; it could span semantic barriers in evaluation and design teams that consist of experts with different competencies and skill levels; it could also be useful for communicating a need for improvement in dysfunctional e-courses to management, by spanning pragmatic barriers.

Our results also indicated that the model seemed useful for beginners and experts alike, both when looking for inspiration or guidelines for design, and when attempting to conduct evaluations. This could imply that the information in the model can easily be accommodated

by beginners, or assimilated by experts (Cakir, 2008). Scaffolding can be described as supporting a novice in achieving tasks they will later, as a result of limited assistance, be able to achieve on their own (Brunner, Ross & Wood, 1976; Brunner, 2015). Presuming that the model can span semantic barriers, the model could then be used as an effective tool in scaffolding the novice's learning to evaluate or design. This further implies that the model could be used as a mediating artefact, allowing the ZoPD of various workers to be met during collaborative efforts when making or evaluating e-courses (Vygotsky, 2015a; Vygotsky, 2015b ; Woolfolk, 2014).

Our results made us aware that we did not take the wider effects of organizational politics into account. This oversight likely derives from the conceptual framework we used when developing the model. Effects of organizational politics could for example be issues such as evaluation results from the HR department not being utilized effectively, if their e-learning contributions are viewed as largely redundant. It would not be much of a leap then, to think that issues related to *best practice* could also be a hindrance to the implementation of our model. If our model's evaluation approach is too divergent from currently established practices, there is a chance it may not be used (Newell et.al, 2009).

Discussions on best practice usually use the term to refer to practices that have worked well in the past, and across contexts, either within or between organizations (Newell et.al, 2009; Zaring, 2006 ; Purcell, 2006). Sometimes best practices are even described as something that establishes itself arbitrarily based on organizational norms (Newell et.al, 2009; Starbuck, 1992). This is one of the reasons why there is still debate around whether, or to what extent, best practices exist. What may work in one organization may not work in another. This implies that an organization's "best practices" for evaluation may not be the best after all.

Considering the influence of earlier evaluation models (CIPP, Kirkpatrick and RoI models), it would not be much of a leap to assume that they have affected some best practices in organizations since their inception. This would come with issues, some of which have been described previously. The Kirkpatrick model (Kirkpatrick, 2000; Holton III, 1996) can provide useful results when applied thoroughly and thoughtfully. However, it seems too cumbersome to evaluate e-courses by looking for indications of behavior change. Calculating RoI can provide some indication of whether a course was "worth it" financially, however, not all e-courses' RoI can be evaluated, due to them not being directly related to the organization's output (Abernathy, 1999). The CIPP model (Stufflebeam, 2000) is useful for

narrowing down what learning is relevant to measure, namely the accomplishment of company learning goals. However as far as we have understood, this model is best applied to sets of courses, instead of singular e-courses. Each model has its strengths, being suited for larger scale learning programs, and determining the value of an implementation. Yet we would argue that to improve learning evaluation models and practices, a leaner model that avoids the mentioned issues, would be better suited for evaluating e-learning in the modern workplace.

It is for this reason that knowledge workers look to models for guidance, re-purpose evaluation models and adapt them to their own practice. This often manifests in only using singular steps instead of the whole model (Horton, 2004), according to what the user finds the most important to evaluate. According to our literature and results, this often involves ”measuring” or assessing learning by looking for change in behavior, user satisfaction and RoI (Abernathy, 1999; Chang et.al, 2017; Holton III, 1996). This way the organization might benefit from using evaluation models. However, by disassembling these models they arguably lose some of their original rigor and purpose, which in turn could weaken the validity of its results. We would argue that these solutions essentially equate to single loop learning (Argyris, 1977). This means that the solutions only address the issue of evaluation in the short run, instead of addressing how or what makes an evaluation valid and hence useful. Though single loop learning can address an error for a time, double loop learning on the other hand provides a more robust solution that will benefit the organization in the long run (Argyris, 1977). Double loop learning in this case would be to change practices in order to develop a more reliable solution. This could be done by for example developing new evaluation models.

We would argue that if organizations want to further develop and improve their use of e-courses, a step in the right direction would be to expand their repertoire of perspectives on learning. Even though a change in behavior may be a desirable result, the road to getting there is a complicated one, because all learning cannot be directly observed or measured as behavioral change. To expand an organization’s repertoire of learning perspectives, they could benefit from using students to create novel learning solutions based on pedagogical science. This would be an inexpensive way of initiating productive change. This idea will be

further explained as we present our reflections regarding various implications for future research.

5.2. External and internal validity

Here we will present our reflections on the validity of our results and their implications. How valid our data collection and findings may be, and how valid the model's use and evaluation approach may be, will be discussed.

As mentioned in the methods chapter, combining strategies of Expert Appraisal, Developer Screening and use-inspired DBR **(McKenney & Reeves, 2019; Plomp & Nieveen, 2007)** was intended to strengthen soundness, feasibility, and validity through the participants' feedback. However, we cannot say with certainty how representative our selection of participants is for other workers in similar positions and/or other organizations. Participants who worked within the same organization often had different backgrounds and roles, and different perspectives and priorities, which was evident when looking at their respective responses to the iterations. For example, the critical participant was one of three participants from the same organization.

As there was only one significantly critical participant, we cannot be sure how representative their criticisms and attitudes might be, past what was indicated by another participant. However, this may have implications for the model's external validity and generalizability in terms of how it may be received by similar members of the target group. Hence, it is hard to say how valid the prototype might be in various contexts and work environments, or if it would be received by the target group the way it was by our selection. However, three of the five organizations were represented by three or more participants, which may at least imply that the internal validity of the model may be stronger within those organizations. It is also worth considering that our selection of participants only consisted of employees in Norwegian organizations. Furthermore, our sample was smaller than would be ideal under optimal circumstances. These limitations have implications for our model's validity, as it reduces the generalizability of our use-inspired design (McKenney & Reeves, 2019), since we do not know how useful it may be in international contexts and practices.

We expected variance in the target groups' practices, and how differences in practice might be accommodated by providing room for interpretation and individual problem solving within the model's steps. How effective this might be cannot be assumed without testing of the prototype, which would also enable us to make further improvements based on the results of pilot testing (McKenney & Reeves, 2019; Plomp & Nieveen, 2007). How validly and reliably the model may determine the pedagogical soundness of e-courses is also difficult to assume without testing it. The internal validity and reliability of evaluation results, and users' process of reaching a final conclusion, would also have to be determined by conducting a pilot test. Our findings indicate that the participants, save one, largely agreed that the evaluation of pedagogical soundness is feasible by using the model. We will detail our reflections and ambitions for pilot testing the prototype, in order to further develop the model and the soundness of its results, in the following subchapter.

We would argue that the perspectives and opinions of our participants validate our approach to some extent, as it was perceived to have merit within parts of the user group, as well as within theory. The practices of human facilitators who enable learning through guidance and encouragement (Berta, et.al, 2015) are arguably similar to how learners may be enabled by e-courses. Digital facilitation in e-courses can also enable learners to reach beyond their ZoPD through support. E-courses' facilitation can work in a similar way by focusing on learning objectives and relevant learner-centered activities (Merril, 2013), that equip the e-course with features that can function as facilitators. Our selection of participants generally agreed with this perspective, as they viewed the facilitative qualities and features of e-courses to be of interest to evaluate.

The critical participant objected (in their feedback on Iteration One) to our approach to surveying users' experiences of their interactions with the e-course. They stated that by only relying on the survey, the model would be just as problematic as other models due to focusing too much on user-satisfaction; assuming it to be a reliable precursor to learning. We would argue that we somewhat avoided this problem during the development of the subsequent models. Doing so by emphasizing that measuring user satisfaction is not the intention of the surveying step, and encouraging the triangulation of several types of data.

How the user interacts with the e-course is also important to consider, because it influences the e-course's impact on the learner. For example, less learning is likely to happen if the e-course does not meet the user's ZoPD to the degree that allows for accommodation or

assimilation (Woolfolk, 2014). How the user internalizes (Nonaka et al, 2000) learning into practice is another important factor. This means that e-courses ought to use content that is related to the user's practice (Littlejohn, 2017). By evaluating the facilitative qualities of e-courses, we take this into account. Therefore, the facilitative qualities of e-course content is what should be evaluated, to determine if it helps users learn something useful in their context and practices, (or *ba)* (Nonaka & Konno, 1998). This, and the use of practice-related follow up after e-courses, also aligned with 6 out of 12 participants' views on what factors to focus on during evaluation and design of e-courses. We would argue that this somewhat validates our prototype, in terms of its relevance to desired and theoretically sound developments within the field of e-course evaluation models.

5.3. Implications for future research

We believe our findings indicate that the theoretical and practical approach to evaluation that we based the LGA Facilitation Model on, warrants further study. We find it reasonable to conclude that the participants expressed a need, or at the very least desire, for new approaches within the field of evaluation.

Considering that our results largely correspond with our literature, we find it reasonable to assume the more attractive models are the ones which are easier to use (Chang et.al, 2017; Abernathy, 1999). Our participants suggested that organizations might be more willing to spend resources on evaluations if they find them easily understandable and attractive to conduct. Meaning that simple and attractive models might improve practices and the prioritizing of evaluation as a part of organizations' policy, since seeing their value would be easier. However, the LGA Facilitation model is still in its infancy. We cannot know to what extent our model might affect practice or policy, or how widely it may be disseminated and integrated. We believe the implications we have presented warrant exploration and study on the matter, all the same.

Regarding implications for theory and subsequent research, we hope our model might have an impact on the discussion, criticism, exploration, and further development of evaluation practices and models. In this regard, we hope for our thesis and prototype to be met with both criticism and interest. Another implication of our prototype is that we hope it may prompt the creation of other prototypes and models, increasing the availability of options for those who

seek guidance for evaluation or design. This seems to be highly relevant (as underlined unanimously by our participants) and motivated our choice to study this ourselves.

We believe it would benefit this specific field of research to focus more on solutions to the wickedness of evaluation problems, in addition to the value of continued criticism and research on the application of existing models.

Presumably, the product of our research is an original contribution to fields of research such as workplace and adult learning, application of e-learning courses and evaluation practices in organizations. We have not come across anything like our prototype or evaluation approach. Due to our application of DBR we also presume (or rather hope) that our research might hold some degree of merit as a contribution to both theory and practice. As such, we assume it may have various implications for policy, practice, theory and subsequent research.

5.3.1. Further implications and research recommendations

An implication for future research we were made aware of concerned the value of students as contributors to various fields of practice in organizations. Since students and academics are awarded time and/or resources purely for the purpose of research and innovation, they can make valuable contributions to practices also outside of academia.

Our thesis was suggested to serve as an example of how students may attempt to contribute to such practices and problems in organizations. We did so by collaborating with members of our target group, who represent various organizations' problem owners, to strengthen the validity and value of our contribution (McKenney & Reeves, 2019). We would argue it could benefit organizations to make greater use of students when attempting or needing to innovate and solve wicked problems. Perhaps especially when problems are wicked and best addressed by use of theory-heavy and time-consuming processes; such as DBR (Plomp & Nieveen, 2007). In several ways, such collaborations might benefit both parties. The students could gain experience and knowledge within their field of study and of the problem owners, while contributing to both, opening doors for further research and opportunities. Organizations could save time and resources; gain access to students' knowledge about the subject of the problem; and might ultimately gain solutions or improvements of practice, which they may not have been able to obtain themselves.

An issue we encountered and considered necessary to address; that of potential exploitation or discounting of students. During our early search for participants, prior to contact with our final selection, we encountered what we would define as problematic attitudes towards students on a handful of occasions. These attitudes struck us as a serious issue, due to their counterproductive implications to the possibilities of fair and mutually beneficial collaboration. Hence, we believe this also warrants further investigation and research.

5.3.2. Ambitions for further pilot testing

We conceived of a potential method of pilot testing during the second round of interviews. We briefed a participant on this idea when the topic of testing came up. This participant seemed to approve of our idea, which meant a lot to us due to their competence and experience within the scientific field of education, evaluation and quality assurance. Based on this encouragement, we continued design discussions on how testing might be executed/implemented. A pilot testing method would be based on further DBR principles, and yield data that would allow for improvements of the model's shortcomings and potential pitfalls. This would include features and areas of the prototype we have problematized and previously expressed our desire to improve upon. The method we would suggest is built on our previous work but extends it in important ways:

- Several teams and individuals would use the model for design or evaluation.
    - Half of the participants would receive our guidance when using the model. The other would function as a control group.
    - We would observe all participants' use of the model.
- This would presumably allow us to observe and document discrepancies between issues encountered during design VS evaluation; the model's use by the control VS guided group; the issues of groups VS individuals; and more.
- We would document and analyze the results, before further improving the model.

6. Conclusion

We find it reasonable to say that e-courses have come to stay, since based on our literature they do not seem to be going away (Van der Wardt, 2014). Thereby, we consider it important to know if they work, in all the various workplaces and institutions they are used in. How we have attempted to answer the primary question and subsequent research questions, will be addressed.

To the best of our understanding, evaluations are considered to be very important and highly relevant, and organizations often approach them in different ways. Sometimes evaluations are either oversimplified or neglected altogether, due to lack of knowledge and competence, or lack of willingness or ability to spend resources on it. This is discussed in our literature on other evaluation models, as well as in our own data. Hence, we created our own model that evaluates the pedagogical soundness of e-courses, as opposed to behavioural change, user satisfaction or return on investment.

We developed a prototype of the LGA Facilitation model as a leaner alternative to other evaluation models, and specifically designed to be relevant and flexible enough for e-courses. It aims to be simple and relatively easy to execute in three steps; 1) define learning goals, 2) identify facilitators, 3) check the quality of the course's facilitation of learning goal achievement. This was done by first designing Iteration Zero, which was then refined three times by creating new model iterations based on feedback from our participants.

The model also came to feature design guidelines based on the same pedagogical principles as the evaluation guide. These were added because our participants made us aware of how design can be seen as a complementary process to evaluation. Hence, it became a secondary focus of our prototype. Another way the feedback impacted our model was by prompting us to include analytics as a factor that would be triangulated with survey data and the evaluators' reflections. Arguably, this would yield more reliable results. As the model iterations were refined, we incrementally improved Step 3's guidelines and content, providing clearer instructions for result achievement and interpretation. This, and the implementation of design principles and guidelines, were some of the most impactful ways in which our data affected the model's development.

The importance and relevance of evaluation was the most unanimously agreed upon sentiment among all participants. All but one of them also agreed with the potential merit of

our approach. Overall, the iterations were seen as significant steps in the right direction, as we attempted to design a potential solution to our primary and wicked research question. The inclusion of design guidelines was also highly approved of, and many offered their opinions regarding its usefulness for many various reasons. The model's potential to function as a boundary object for evaluators, designers and their customers, as well as cross-disciplinary teamwork, was also pointed out and greatly approved of.

How validly and reliably the model may determine the pedagogical soundness of e-courses, is difficult to assume without pilot-testing to examine its use and analyze evaluation results. The prototype is ready for testing, as a product of several rounds of refinement to the point where our participants generally seemed to have faith in its potential. The enthusiasm several participants expressed around testing concerned Iteration Two, and many considered that iteration pilot-test ready, despite its potential for further improvement. After the further refinement of Iteration Two, creating the prototype according to their feedback, we would argue that testing could be even more relevant and achievable. Improvements made to the model are intended to make it more understandable, versatile and attractive, which is why we reason that it is viable for testing.

Potentially problematic attitudes toward sound design and evaluation, held by an organization's management, or conflicting best practices, could be an issue that might hinder implementation. It seems like other models have faced this hindrance as well, which is why we consider it likely. Our participants were aware of the likely prevalence of this problem, and informed us of their perspectives on how it might be mitigated. Hence, we designed the prototype with this in mind. When making design decisions involving compromises and tradeoffs based on our findings, we intentionally made the model as simple, compact and aesthetically pleasing as possible. This came at the cost of cutting down content we would have liked to include or elaborate on, in an attempt to improve the feasibility of the model.

Though understanding organizational learning as behavior change is an arguably robust perspective, it may also be regarded as outdated and reductive when applied on its own. Our model is a new contribution to a field that, to our eyes, has stagnated in its focus on behaviour, investment returns and satisfaction. We consider the field to lack perspectives on pedagogical soundness and learning facilitation, or other deviating approaches and focuses on learning from varied theoretical standpoints. We believe that viewing e-course evaluation as a wicked problem would benefit this field of research, as it would inspire the development of

new models and further critiques of established models. Hence, we hope our prototype model will be a valuable contribution, with interesting implications for further research, and we look forward to continuing its development in the future.

We would also argue that if organizations want to continue to develop novel learning solutions, then adopting more diverse learning perspectives would be beneficial. We have come to firmly believe that students can play an important role in this regard. Students possess new perspectives, knowledge, competencies, as well as access to time and other resources through their institutions of higher education. Organizations could presumably address their wicked problems to a greater extent, by collaborating with students who have time and resources to develop solutions, by using DBR for instance.

6.1. "Workplace E-learning, Does it Work?"

The main question of our thesis is arguably a somewhat rhetorical one, since it refers to a wicked problem with no clear cut answer. However, we still consider it a reasonable research question due to the fact that wicked problems can still be attempted to be solved, by developing novel potential solutions.

Our answers consist of a suggestion and an argument, based on our design based research and findings. The suggestion being our prototype model, as a way of finding answers to the problem, and our argument being; yes, e-courses *can* work if they are designed and implemented in a pedagogically sound manner, and in order to know *if* they work they ought to be evaluated based on their pedagogical soundness. Gauging their soundness by evaluating their facilitation of learning goal achievement would be an appropriate approach to doing so, according to our research. At the very least it would be a novel one that might contribute to further developments within our field of research. Including guidelines for e-course design that followed the same principles, also seemed appropriate based on our findings; answering our final and unintended research question.

With that being said, we would be reluctant to say that there is any universal approach to evaluating e-learning. Whether the aim is to evaluate singular courses, or wider curricula of blended learning implementations, different models are suited for different aims. Nonetheless, we would argue that evaluations and pedagogical principles are important when attempting to answer the question of whether or not e-courses work.

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Appendixes

We sent out the models to our participants in PDF format. Meaning that in order to include the models as appendices we needed to re-format them into Word.

I. Information letter

Are you interested in taking part in the research project

”Achieving learning goals in e-learning;

Exploring a possible approach to evaluating learning goal achievement through e-course use in organizational contexts”?

This is an inquiry about participation in a research project where the main purpose is to see if e-course use in working life results in learning. We want to develop a hypothetical evaluation method, in the form of potential guidelines to evaluate the “learning effect” of e-courses, by using an approach based on "learning goal achievement". In this letter we will give you information about the purpose of the project and what your participation will involve.

Purpose of the project

The purpose of our master’s thesis is to design the foundations for a method that can be used to examine if e-course users achieve the desired learning outcomes of the course. The intention behind the project is to see if e-courses result in relevant learning or not. Little research can confirm whether traditional evaluation methods can be used to adequately examine how e-learning effects or results in learning. The method we want to develop is therefore specifically aimed at evaluating e-learning and is intended as a basis for testing and further research.

Who is responsible for the research project?

The institute for pedagogy (IPED) in the faculty of Educational Science at the University in Oslo is the institution responsible for the project.

Why are you being asked to participate?

We wish for you, as a participant, to provide feedback on 1-2 iterations of the method we are designing, they will be sent individually at separate stages in the design process. We wish for

you to provide us feedback on how you perceive our drafts of the method, e.g. in terms of perceived usefulness, ease of use, potential strengths/shortcomings, etc. (More on this below.)

What does participation involve for you?

- Choosing to participate in the project means reading through one or two drafts of the evaluation method sent to you. We estimate approx. 45 min. to read the description of the method and look at any illustrations of an evaluation method. Then approx. 30 minutes to complete a questionnaire. The questionnaire contains questions about the content, design and perceptions of the submitted draft and its useability. After filling in the questionnaire you will have to participate in an interview of 45-60 minutes. All this we estimate will take you approx. 2.5 hours or potentially 5 hours in total if you agree to look over the second iteration of the evaluation method, though we encourage participation in both rounds.

- Your answers from the questionnaire will be registered electronically and will only be available to those who are closely associated with the project (mainly us and our supervisor). Some of your answers to the questionnaire will be followed up in the interview (likely conducted over Zoom or MS Teams, in light of the COVID-19 pandemic and national/local rules and guidelines). We will audio record the interview, with the intent of being able to transcribe and analyze the content.

All data collected from you and other participants will be stored in accordance with laws and regulations regarding privacy and the processing and storage of personal data. More information about this follows.

Participation is voluntary

Participation in the project is voluntary. If you choose to participate, you can withdraw your consent at any time without providing a reason - all information about you will then be deleted. There will be no negative consequences if you choose not to participate or later decide to withdraw. Participation will not influence your relationship with your employer or affiliation with other organizations etc., as we will not make participants' data available to unauthorized persons outside the project.

Your personal privacy – how we will store and use your personal data

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- Information we collect from or about you, which is not relevant to the project and its purpose, will be deleted.
- We will request information about your educational background, work experience and current job position. For the purpose of explaining the basis of why we selected the participants we did for the master thesis (without including specific information that can reveal or be traced back to the participants' identity.)
- The actors who will have access to your data and other relevant data, intended for use in the project will be us; Rebekka Walle and Tobias Tungland (master students), our supervisor at the Faculty of Education at the University of Oslo (Anders Mørch), and potentially superiors, administrators or other relevant actors at the university or privacy/research bodies who need access to check that we have complied with all the privacy regulations we intend to follow.
- We will replace your name and contact information with a code that is stored in a list separated from other data. Information and data will also only be obtained via services provided by the University of Oslo, approved for use in processing the type and classification of data we are to collect and process.
- We will only store the data material on approved servers and services provided by the University of Oslo. Information stored outside the University's approved services, e.g. on hard disks or memory sticks, will be password protected/encrypted. No data related to the project will be processed or stored on private devices (such as PCs, phones, etc.)

What will happen to your personal data at the end of the research project?

The collected data will be stored in a sufficiently anonymised and coded form when the project is completed/the thesis is approved, which according to the plan is in August 2021. After this we wish to keep some of the data to enable further research or follow-up studies on the method’s development. We will keep the data for up to 5 years (30. August 2026) before it is deleted. Only relevant personal information and data will be retained in text format as recordings and similar data will be deleted. Data kept after the end of the project will be stored in accordance with the privacy regulations, on approved servers connected to UiO.

They will only be available to us and those who may be associated with related projects (such as supervisors, administrators, co-researchers, etc.) in confidence.

Your rights

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

What gives us the right to process your personal data?

We will process your personal data based on your consent.

Based on an agreement with The University of Oslo, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project, or want to exercise your rights, contact:

- *University of Oslo* via *Anders Mørch* by email: (anders.morch@iped.uio.no) or by telephone: +47 22 84 07 13
- The Data Protection Officer at the University of Oslo: Roger Markgraf-Bye: (personvernombud@uio.no)

if you have any question about NSD's assessment of the project, you can contact:

- NSD – The Norwegian Centre for Research Data AS, by email: (personverntjenester@nsd.no) or by telephone: +47 55 58 21 17.

Yours sincerely,

Supervisor

Anders Mørch

Students

Rebekka M. C. Walle & Tobias M. Tungland

Consent form

I have received and understood information about the project "Achieving learning goals in e-learning; Exploring a possible approach to evaluating learning goal achievement through e-course use in organizational contexts" and have been given the opportunity to ask questions. I give consent:

- □ To participate in answering questionnaires after reviewing submitted material, as well as follow-up interviews based on answering questionnaires.
- □ That my personal information is stored after the end of the project, for use in any further research.

I give consent for my personal data to be processed until the end date of the project,

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(Signed by participant, date)

We will here be requesting information about your educational background, work experience and current job position, as prefaced in the information letter.
Please submit the following:

- "General information about your educational background
  (Educational program(s), field(s) of study, length/degree of education, etc.)"

[FREE TEXT ANSWER]

- "General information about your work experience
  (Academic/practical competence, years of activity in relevant fields of work, etc.)"

[FREE TEXT ANSWER]

- "General information about your current job position
  (Responsibilities and professional tasks/goals, organization of employment, etc.)"

[FREE TEXT ANSWER]

II. Feedback survey

Survey (Nettskjema)

1. Liker du modellutkastet?

(Hvorfor/Hvorfor ikke?)

(Hva likte/likte du ikke?)

English: *Do you like the draft of the model?*

(Why/Why not?)

(What did you like/not like?)

2. Synes du innholdet og instruksjonene i modellen er formulert og strukturert på en forståelig måte?

(Hvorfor/Hvorfor ikke?)

English: *Do you think the content and instructions in the model are formulated and structured in an understandable way?*

(Why/Why not?)

a. Hva mener du evt. kan forbedre innholdet og instruksjonene i utkastet?

English: *What do you think might improve the content and instructions in this draft?*

3. Hvor brukervennlig og gjennomførbar har du inntrykk av at modelen kan være i praksis?

English: *How user-friendly and feasible do you think this model might be in practice?*

a. Hva kunne forbedret metodens praktiske gjennomførbarhet?

English: *What might improve the model's practical usability?*

4. Hva slags utfordringer kan du forestille deg ved bruk av modellen?

English: *What challenges do you think one might encounter when using the model?*

5. Tror du fokuset på "L.G.A" (læringsmåloppnåelse) i modellen kan fungere til å indikere om et e-kurs fasiliteter ønsket læring?

(Hvorfor/Hvorfor ikke?)

English*: Do you think the focus on "L.G.A" (learning goal achievement) in the model might be useful for indicating if an e-course facilitates desired learning?*

(Why/Why not?)

6. Etter din erfaring og kunnskap, hvor aktuelt og/eller relevant oppfatter du at evaluering av e-kurs i arbeidslivet er?

English*: In your experience or from your knowledge, how useful and/or relevant do you perceive evaluation of e-courses in the workplace to be*

III. Iteration Zero

Achieving learning goals through e-learning;

Exploring a possible approach to evaluating learning goal achievement through e-course use in organizational contexts

Preface

Our ambition with this master's project and thesis is to contribute something new and interesting to a young field of study, namely e-learning evaluation methodology. We wish to design the foundation for a new form of evaluation, that may lend itself more practically towards organizational and occupational training through e-learning. Our hope is that our work may contribute to making evaluating more accessible and efficient, more frequently utilized, and that e-learning practices and courses may further develop and improve due to more feedback. This is something we are passionate about and wish to study and develop further, and we thank you for your participation.

The LGA Facilitation Model

The Learning Goal Achievement (LGA) Facilitation model aims to determine whether an e-course is pedagogically “sound”. By “e-courses” in this context we mean e-learning content meant for training and knowledge/skill development in the form of a course. This means evaluating an e-course based on whether it possesses learning facilitators that enable the achievement of defined learning goals. We have considered this to be more important than attempting to measure learning itself, because the process of evaluating "learning" as an abstract concept is too complicated to yield useful results without becoming costly as well as work- and time consuming. Instead, by determining if a course is pedagogically “sound” in how it may facilitate learning, we would argue that it is then more likely to result in learning than a course that isn't similarly pedagogically sound. We would argue that such an approach is more appropriate for determining if an e-course can be considered an effective learning resource in enabling the achievement of learning goals.

This focus on learning facilitation arrives from an analysis of evaluation models in our reviewed literature. There are very few existing evaluation models that are angled toward evaluating e-courses in particular. E-learning specific models we have found tend to be based on older evaluation models that have been designed for in-person courses and seminars. We noticed that these older and widely disseminated evaluation models, meant for traditional employee training, seem to have notable recurring issues. Firstly, we find that existing evaluation models’ claims of measuring learning reliably and objectively were often rooted in concepts that don't directly equate to learning; like user satisfaction (Cheng, & Zhang, 2020), return on investment (Fusch, 2008), or tracing knowledge development and behavioral change (over time) back to the courses somehow (Moreau, 2017). Secondly, these models seemingly require too much time and resources spent on execution, to the point of it becoming unattractive to complete the evaluation in its entirety (Horton, 2004). For example, this was indicated in our literature by a trend of commonly abandoning the evaluation process entirely after the first or second steps of a 4-step model. Thirdly, we took issue with how we perceive these models to define and view learning in this context as a process where courses transfer

knowledge/information into the user. Like two computers exchanging information. According to our education and understanding of learning, it does not occur this simply and one-sided. We find it more appropriate to see learning as a complex process that occurs within the learner. Meaning that the e-course can present knowledge, but it must be understood and processed in the mind of the user in order to be "learned" (Vygotsky, 2015a ; Vygotsky, 2015b). We would argue that how an e-course facilitates this process is a more appropriate focus for the foundation of an e-course evaluation model.

When organizations implement courses, it is presumably done with the intention of the course takers learning something specific. We therefore consider his type of organizational learning to be goal oriented (Colley, Hodkinson & Malcolm. 2003). Hence, we also have an additional focus on how e courses facilitate the achievement of the specific learning goals of and in the e-course.

The model we have designed is meant to be easy to understand and execute in terms of time, resources and scope. It focuses specifically on how e-courses facilitate LGA. The model is therefore split into three parts or steps. Namely, defining learning goals, examining learning-facilitating factors, and finally surveying course-takers experience of the course. Each part is meant to be completed in chronological order as steps to a complete evaluation. However, in theory, you can stop after the first or second step (which seems to be a common issue with 4-stage models, (Horton, 2004) without your work being entirely without merit. If only step 1 is completed, an evaluation has not been conducted, but we argue that reflecting on the actual learning goals and purposes of a course has some merit in and of itself. In summary we would argue that reflecting on learning goals as a first (and potentially only) step is wiser than to e.g. only complete a step that evaluates user-satisfaction, seeing as satisfaction is not the same as learning.

If the evaluation process is abandoned after completing step 2, then further reflection has at least been put into the e-course's functions and quality. We consider it important that courses of specific topical content are employed and evaluated by evaluators familiar with the topic. An HR-representative in a company that produces car parts would be better suited to evaluate a course they use to learn about car-part-production, than someone outside that field. Hence, we have designed this step to focus on evaluating courses' learning-enabling qualities/quality, and not the subject matter of the content. We present a guide and table for evaluators, to aid them in detecting indicators of sound learning facilitation. We intend for this to allow enough flexibility for the model to be practically useful within many different occupational and organizational contexts. The defined goals from step 1 will be used in step 2, to examine if the course seems pedagogically sound in how it may facilitate the achievement of those goals. In summary; do implemented courses' delivery of content align with intended learning goals and enable their achievement?

The third step is meant to function as a form of hypothesis testing. The evaluator may in this step use their reflections and conclusions from step 2 to design a survey for course takers to complete, in order to examine how it was perceived and experienced in terms of facilitating LGA. The purpose of the survey is to collect data about how course users understood learning goals, about their achievement of them, and how they experienced being facilitated towards achievement. This data triangulates three factors of interest to see how they practically align after the implementation of the course: Learning Goal Understanding, Learning Goal Facilitation and Learning Goal Achievement. This is intended to lead to a conclusion to the evaluation, regarding the extent of LGA resulting from the course's pedagogical and topical quality. If all three factors align - meaning the goal was clear; the course seemed pedagogically sound in presenting relevant content in way that enabled learning; and the learning goals were achieved as a result - that may indicate that the e-course successfully delivered on the desired learning outcome.

After explaining these steps and our reasoning for the design, it should go without saying; completing all the steps is recommended, as well as intended to be possible without necessarily

being excessively costly to the organization.

Basic illustration of the model (?)

(A flow-chart-like explanation of the purpose and progression of the steps, followed by a venn diagram illustrating the purpose of aligning L.G.U., L.G.F. and L.G.A.)

Step 1

Defining Learning Goals

To identify the intended outcome and purpose of the course being implemented

Mainly three larger factors will affect how you go about this step. If the course you are evaluating was internally produced by your organization, then sources and information may are more likely to be accessible to you. If the course was requested or bought for your organization, investigating the details of the request/order along with communication with the suppliers of the course may be helpful. Lastly, if you are evaluating a course that was already produced by (and/or potentially for) some other organization or purpose, this might require more independent interpretation, investigation and preferably getting in touch with those who produced the course.

These questions are example prompts for reflection/inquiry that are meant to help you determine what goals may be defined/present in a course you have implemented.

- Was this course designed with a learning goal in mind?
- Does the course explicitly state any learning goals?
    - If so, are those goals defined by/relevant to the intended outcome and purpose of your implementation of it?
- Do you know who requested, designed and administered this course?
    - What were their intended learning goals for this course (if any)?

Theoretical background – Learning Theory

It is important to keep in mind, when formulating goals and looking at the below table in step 2, that each pedagogical "facilitator" has its basis in learning theory. We have classified these learning theories into three broad categories. These classifications selectively draw from theory in ways we find relevant for e-learning. The below categories are in no way covering the whole spectrum of learning theories, but instead highlight relevant aspects that can be argued to be highly applicable for e-learning.

Behavioral

Behavioral learning theories view learning as a gradual process of incremental behavior change by reinforcing desired behaviors and discouraging undesired behavior (Benjamin, 2007 ; Bremner, Holt, Passer, Smith, Sutherland & Vliek, 2015 ; Woolfolk, 2014). Bluntly put, this is done by implementing rewards to reinforce "good" behavior and punishments to discourage "bad" behavior. In e-learning these theories may take shape in the form of e.g. encouraging positive learning behaviors like selecting correct answers, or discouraging undesired behaviors by impeding progress when selecting incorrect answers (Mayes & freitas, 2007 ; Chen & Lewis, 2010 ; Afifi & Alamri, 2014 ; Gagne, 1974). This approach is often involved in the groundwork of setting up reward systems in instructional e-courses. The thought is that by breaking down a larger learning outcome into a hierarchy of smaller components, the learner has to complete the simpler pieces before accessing the more advanced ones and completing the course (Mayes & freitas, 2007; Gagne, 1974; Afifi & Alamri, 2014). This plays on the same principles, where the course rewards behaviors that contribute to achieving the ultimate learning outcome and "punishes" by impeding progress if the user answers incorrectly. It should be noted therefore that "rewarding" have been shown to be more effective than "punishing" in learning new behaviors. (Scott, Jain & Cogburn, 2021). The key facilitators that we

decided to include from behavioral theories have an emphasis on feedback (in form of rewards or punishments), gradual steps and incremental increase of challenge with clearly defined learning outcomes.

Cognitive

Cognitive learning theories have their roots in cognitive psychology where the study of mind and behavior is done through a lens of viewing the brain as a computer, hence there is a large use of computer metaphors with an emphasis on memory, attention and reasoning (Bremner et. al, 2015 ; Woolfolk, 2014 ; Mayes & Freitas, 2007). Furthermore there is often an element of constructivism in cognitive learning theories, meaning that in addition to looking for how the brain processes information there is an additional emphasis on how the brain creates meaning and knowledge (Affifi & Alamri, 2014 ; Mayes & Freitas, 2007 ; Chen & Lewis, 2010). In practice this means facilitating learning through exploration, play and problem solving. E-courses influenced by cognitive learning theories would ideally stimulate the learners to think for themselves; encourage learners to create meaning by using the information in the course; and make sure not overwhelm learners with the display of information, but instead support the understanding of the content. The facilitators that are included in the model pay particular attention to how users process the information in the course.

Social

Social learning theories hold that people learn best when interacting with other people. The perspective holds that learning is “situative” (Mayes & Freitas, 2007, p.18), in that the learning outcomes are somewhat affected by the social environment around them. This means that the expectations of others influence how well the individual does. This can often be seen in how people e.g. learn by observing others, become motivated or encouraged by seeing others succeed, or learn through the active exchange of ideas (Newell, Robertson, Scarbrough & Swan, 2009). In using social learning theories, one may find themselves opting for the use of a lot of group work. The intent behind this is to enable learning through the sharing of ideas, experiences and information. A key element to this is that by explaining something to others the individual cements the knowledge in their own head through repetition and formulation, as well as giving additional knowledge away to someone who may use it. Another key process is that by sharing ideas individuals can create new knowledge by combining what they both know, as well as creating all together new knowledge neither individual was in possession of prior to their group work (Woolfolk, 2014 ; Vygotsky, 2015. a ; Vygotsky, 2015. b). E-learning programs that involve social learning theory may encourage group work and include their own or use of digital platforms for social interaction (this can be online forums, interacting through social media or video games, chats, video conferences etc.).

Step 2

Examining Facilitating Factors

To evaluate the presence, relevance, and pedagogical soundness of facilitation

The intention and goal of this step is to examine, reflect on and define how the learning goals are made possible to understand and achieve. If a course is pedagogically sound, then it has factors that facilitate learning. This step is meant to help you determine if a course is in possession of such facilitators, to evaluate its potential to deliver on desired learning goals. Evaluating courses can be beneficial for finding areas of improvement, need for follow-up, etc., regardless of if they are internally produced or externally commissioned/sourced. The goal is to be able to evaluate in order to learn more about how courses can be used, and how they may best benefit your organization, based on your findings.

Disclaimer: *Facilitation can take many forms beyond the ones listed below, but any "facilitators" you may identify ought to be rooted in research if you wish to include them in your evaluation – to make sure they work the way you think.*

FIRST DRAFT/ITERATION OF "FACILITATOR TABLE"

Facilitator	Explanation	Example	Sources
Gradual steps	Presenting knowledge in small pieces in order to gradually build a larger more whole understanding of the topic This can often look like a hierarchical presentation of content, where the first units of information are meant to be fundamental for understanding the more advanced concepts.	Gradual increase in difficulty Segmented exercises	Beetham and Sharpe, 2007 Chen & Lewis, 2010 Gagne, 1974
Positive OR Negative reinforcement	Rewarding the learner upon e.g. providing correct answers, to encourage them to continue to do so. OR Punishing/discouraging the learner when they e.g. fail a task, to discourage them from continuing to do so.	Receiving immediate positive feedback upon providing a correct answer in an exercise or quiz, in the form of an achievement or prize. OR Needing to start a task over again from scratch due to any error in its completion.	Gagne, 1974 Woolfolk, 2014
Sequenced instruction	Providing elements of knowledge needed to acquire a skill gradually. Only allowing access to further knowledge when the learner provides proof of possessing the prerequisites.	Mastering previous "levels" of a course before being allowed access to more advanced material	Beetham and Sharpe, 2007 Chen & Lewis, 2010

			Gagne, 1974
Clear focus on learner outcome	Setting up clear goals allows the learner to reach for a desired outcome. This can motivate the learner. This contextualizes and provides meaning to the learning material experienced in the course	Stating learning objectives at the beginning and end of the course, showing progress through learning goals throughout the course in a sidebar, providing an overview where you can see your	Beetham and Sharpe, 2007 Chen & Lewis, 2010
Digital scaffolding	Could be computer assisted learning or technology mediated social learning in the e-course. The learner is provided support to achieve a certain goal or going through the content of an exercise, until they have developed proficiency to go through the exercise alone.	Automated feedback that responds to learner input, providing guidance or aid when necessary or requested. Feedback and specific advice from individuals, such as a supervisor or teammate, on the learner's progress.	Brunner. Ross. & Wood, 1976 Fischer, Lemke, Mastaglio & Mørch, 1991
Experimentation	The learner is provided an opportunity by the course to create and test hypotheses in a digital environment of the e-course.	Trial-error and exploration of a space or concept in a simulation based exercise, like in a video game or virtual science lab.	Woolfolk, 2014 Chen & Lewis, 2010
Multiple representations	Representing information in a varied visual manner. This can stimulate the learner and allows for a compact method of presenting information that would have required 1000 words.	Graphs, illustrations, simulations or other descriptive visual media that can be used in tandem as to describe various aspects of a given concept.	Linn, 2000
Mnemonics	Information presented in the form of rhyme acronyms or verse to make recall easier.	Acronyms like LGA (learning goal achievement) Rhyme and verse like songs for remembering the ABCs	Woolfolk, 2014 Hattie & yates, 2014

Open answer problem solving	By giving the user what is effectively a blank canvas, the learner is encouraged to construct an answer using the knowledge they already possess.	Avoiding multiple choice, instead allowing for free-text answers in a quiz.	Woolfolk, 2014
Discussion boards/forums	By providing a shared space for the learners to share feelings and ideas, one facilitates and encourages a collaboration between learners	Setting up a space for comments and discussion in the relevant portals for the course.	Sharpe & Oliver, 2007 ***Akrich, 2010***
Roleplay	Encourage novel thinking by providing the learner a set of rules and situations that are unfamiliar or otherwise novel. Can take the form of providing a "role" or character for the learner to play, providing context and opportunity to use knowledge they have learned.	This can occur in a digital space via games like Minecraft or by using other communication programs like Zoom, where you can give learners roles and a scene to act out or simulate, like emergency scenarios, historical scenarios, leadership training or other scenarios.	Eie, Mifsud & Mørch, 2019 Erturk, 2015
Portfolio creation and sharing	By making portfolios learners can construct their own knowledge bases that can be shared or looked back upon for later use. Can function as a key event logger for personal/professional development.	Event logs, personal development planning, digital "mood boards" or "clip boards" and other tools for collecting and organizing material.	Beetham, 2007
Collaborative problem solving	Providing spaces for learners to form groups or teams with the intent of solving a problem, going through learning content or creating a product. To facilitate collaborative work there must be a space, digital or otherwise that the learners can inhabit. The activities must be goal-oriented in terms of solving the problem.	Collaborative building in Minecraft and similar multiplayer games that may be relevant, forums and discussion boards, digital meetings, roleplaying a scenario requiring e.g. teamwork or social skills.	Eie, Mifsud & Mørch, 2019 Roschelle & Teasley, 1995

Step 3
Surveying course-takers' understanding, facilitation and achievement

To evaluate perceptions of the defined goals and facilitation of goal achievement within the course material and through its completion

This step is meant to back up or disprove the conclusions from step 2, by surveying the course-takers. Here we include some basic guidelines for producing a short questionnaire concerning the understanding, facilitation and achievement of learning goals through taking the course. This can yield results that could point away or in the direction of what the evaluator perceived and concluded in step 2. In other words, if the questionnaire shows that course-takers experienced some form of facilitation of their learning (e.g. felt rewarded) - in addition to the evaluator finding the course pedagogically sound in its use of facilitators (that were e.g. intended to be rewarding) - then this would indicate that the evaluators' conclusions in step 2 are strong, as the course-taker feedback supports their evaluation.

If a facilitator has been experienced as a hindrance instead of an enabler of learning, it may be wise to encourage the user to explain why they experienced it that way. This type of data, or very positive data about certain facilitators, could potentially be useful when producing, commissioning or sourcing courses in the future, since you have an idea of how your course takers might respond to different facilitators in various types of courses.

The below guideline can be used roughly for creating the form of questions you might want to include in the survey. We recommend basing the questions on a combination of content ("X") from the table. This ought to be done in an order that allows you to see if facilitators are present, sound in their intended effect, and what they may have facilitated; whether it is the facilitation of understanding, possibility of achievement, and/or the actual achievement of learning goals.

QUESTION (basic example of formulation based on previous steps):

"Did you experience ("Facilitator" in its specific form) as a means of (relevant form/formulation of "Explanation") helpful to (understand/facilitate/achieve the learning goal) ?"

ANSWERS (examples of general multiple-choice options):

A. Positive (particularly helpful)
B. Positive neutral (a little helpful)
C. Neutral (neither helped nor hindered)
D. Negative (hindered)

Further example: Let's say you are evaluating a course for hospital staff and the course is about how to properly wash your hands. It has a quiz at the end containing questions based on the content in the course. The quiz has 10 questions. When a question is answered incorrectly, the user loses all progress in the quiz. When a question is answered correctly the user is awarded by gold star appearing on their screen along with a happy jingle. You might include a question like this in your evaluative survey:

"Is discouraging incorrect answers in the form of receiving immediate feedback upon providing an incorrect answer, by losing all your progress, helpful in learning how to wash your hands?"

E. It was very helpful in my learning
F. It was helpful in my learning
G. It was not helpful in my learning
H. It hindered my learning

IV. Iteration One

Achieving learning goals through e-learning;
Exploring a possible approach to evaluating learning goal achievement through e course use in organizational contexts

Preface

Our ambition with this master's project and thesis is to contribute something new and interesting within the field of e-learning evaluation methodology. We are designing a foundation for what we hope to be a new form of evaluation model, meant for organizational and occupational e-course use. We hope that our work may contribute to making evaluation methods more accessible, efficient and frequently utilized, and that e learning practices and courses may further develop and improve due to increased feedback. This is something we are passionate about and wish to study and develop further, and we thank you for your participation.

The LGA Facilitation Model

The Learning Goal Achievement Facilitation Model is meant to help you figure out if an e-course can result in learning, and therefore is “sound”. What we mean by “sound,” is that a course possesses “facilitators” meant to enable learning in the user. E-courses that are sound are more likely to facilitate Learning Goal Achievement (LGA) than courses that are not sound. We define e-courses as content that is meant for employee training and knowledge/skill development in the form of digital courses.

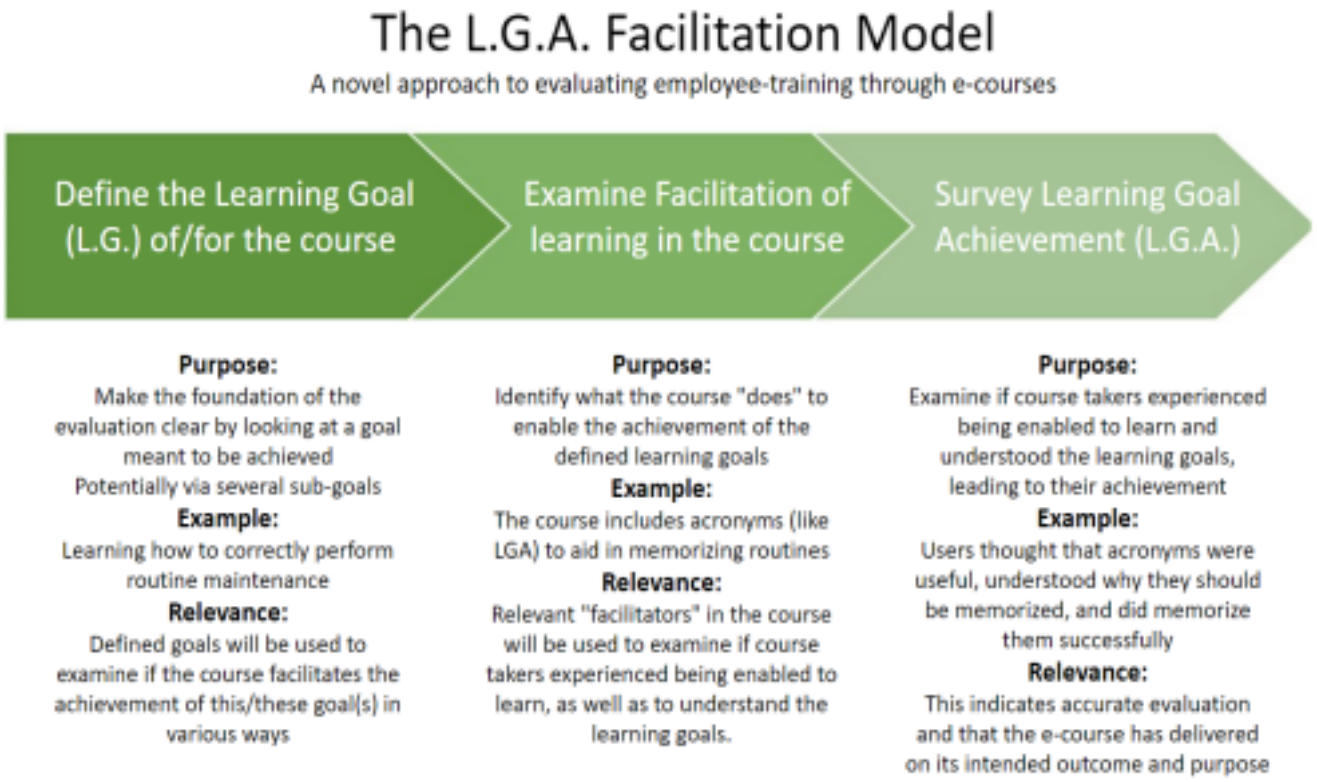
Learning in this model is viewed in context of the e-course's learning goals. We believe goals are important, because when organizations make use of e-courses it is presumably done with an intention. These intentions are viewed as goals that the e-course is meant to help its users achieve. Therefore, the learning the e-course is supposed to facilitate, is the learning that needs to happen for learning goal achievement to happen. This is why we focus on what a course may do to facilitate learning, instead of trying to measure “learning" itself. Trying to find cause-and-effect relationships in learning scenarios (like most models do) is such a long, slow and complicated process that it isn't attractive for organizations interested in evaluating e-courses. Instead, the focus of this model is to allow for speedier evaluation, with results that can indicate if a course possesses pedagogical and sound facilitators that make it more likely to result in LGA.

The model is meant to be easy to understand and conduct in terms of time and resources, and it has 3 stages; defining learning goals, revealing facilitators, and surveying course-takers. Each part is meant to be completed in chronological order, as steps to a complete evaluation. If only step 1 and/or 2 are completed, an evaluation hasn’t been conducted, but we would argue that reflecting on learning goals and how their achievement may be facilitated are useful exercises anyway.

Before going through the stages of the model in more detail, we will briefly describe an example e-course (based on one we’ve taken ourselves) we will use as a “case”, in order to show you how the evaluation process might look in practice. Our example case is an infection prevention e-course. This

course features blank, white slides of text, next to an image displaying the information in each slide. There are also videos in the course, showing the user how to properly wash their hands. At the end there is a short quiz, and the course takes ca. 45 minutes to complete in tota

Basic illustration of the model:



Step 1

Defining Learning Goals

What goal(s) need to be achieved to satisfy the desired outcome and purpose of using the e-course?

The goal of this step is to identify what learning goals are meant to be achieved from using the e-course. In step 2 we present a guide and table to aid in detecting facilitators that help users achieve defined goals. Meaning that goals from step 1 will be used in step 2, to examine if the course seems pedagogically sound in how it might be facilitating the achievement of those goals.

If you are going to define goals for a course that you e.g. are unfamiliar with, or uncertain if you understand the content of, then getting in touch with someone who does is important. If the course you are evaluating was internally produced by your organization, then sources and information is more likely to be accessible to you. If the course was requested or bought for your organization, investigating the details of the request/order along with communication with the suppliers may be helpful. Lastly, if you are evaluating an e course that was already produced by (and/or potentially for) some other organization or purpose, this might require more independent interpretation, investigation and preferably getting in touch with those who produced the course.

These questions are example prompts for reflection or inquiry, meant to help you determine what goals may be defined/present in an e-course you are evaluating.

- Was this course designed with a learning goal in mind?
- Does the course explicitly state any learning goals?
    - If so, are those goals defined by/relevant to, the desired outcome and purpose of your use of it?
- Do you know who requested, designed and/or administered this course?
    - What were their intended learning goals for this course (if any)?

Example: The infection prevention course states in its starting slides what content it will go through in sub categories of the course. These can function as defined learning goals because the course explicitly states what it wants the user to learn. However, one of the sub-categories has no specified learning goals and uses vague language to portray its content. We could speculate as to what the goal is with this part of the course, but we could (and maybe should) ask the course producers to clarify their intentions for this part.

Step 2

Examining Facilitation

What facilitators of LGA are present and relevant within the e-course?

The purpose of this step is to examine, reflect on and define how the learning goals are made possible to understand and achieve. If a course is pedagogically sound, then it has facilitators that enable learning, like the ones explained in the table below.

Example: Seeing as our example course is mostly made up of white slides with text, and is rather long, it relies on the user to be self-motivated and to read all the content on all the slides. When the course uses facilitators, they are few and far between. It makes use of facilitators from the table; like “multiple representations” by including videos and images, and there are some cases of “reinforcement” in the quiz. There is “negative reinforcement”, to discourage from answering questions incorrectly, by losing all progress in the quiz. When a question is answered correctly the user is awarded by gold star on their screen along with a happy jingle, as “positive reinforcement” to encourage correct answers. Based on these reflections in stage 2, we can begin to assume that this course isn't particularly sound, e.g. since its use of pedagogical facilitators is so sparse. However, we still need to complete step 3, to see if users of the course *did* find it facilitating.

Disclaimer: Facilitation can take many forms beyond the ones listed below, and as such many have yet to be listed below or have been somewhat integrated within present facilitators.

FIRST DRAFT/ITERATION OF “FACILITATOR TABLE”

Facilitator	Explanation	Example(s)
Gradual steps	Presenting knowledge in small pieces in order to gradually build a larger more whole understanding and mastery of a topic. This can often look like a hierarchical presentation of content, where the first pieces of information are meant to be building blocks for understanding the more advanced concepts.	Gradual increase in difficulty in segmented exercises, or game-like tasks with a narrative progression where the tasks become more and more complicated.
Sequenced instruction	Gradually and intentionally providing pieces of information that is needed to acquire a skill or knowledge, in a specific order. Only allowing access to further knowledge when the learner provides proof of possessing the prerequisites.	Step-by-step instructions on how to navigate a website, use equipment safely, perform maintenance tasks, etc. Structured slides in an order that does not allow for skipping slides.
Positive OR Negative reinforcement	Rewarding the learner upon e.g. providing correct answers, to encourage them to continue to do so. OR Punishing/discouraging the learner when they e.g. fail a task, to discourage them from continuing to do so. It should be noted that rewards have been shown to be more effective than punishments.	Receiving immediate positive feedback upon providing a correct answer in an exercise or quiz, in the form of an achievement or prize. OR Needing to start a task over again from scratch due to any error in its completion.
Clear focus on learner outcome	Clarifying goals to allow the learner to understand them and reach for a desired outcome. This can motivate the learner, because it allows them to intentionally try to achieve the goals. This contextualizes and provides meaning to the learning material experienced/presented in the course.	Stating learning objectives at the beginning and end of the course, providing an overview where you can see your progress in completing partial goals, or providing reminders of the purpose of (or incentive behind) the course throughout its content.

Social OR Digital scaffolding	Could be social assistance OR computer assisted learning integrated in the e-course. The learner is provided support to achieve a certain goal or going through the content of an exercise, until they have developed proficiency to go through the exercise alone.	Feedback and specific advice from individuals, such as a supervisor or teammate, on the learner's progress. OR Automated feedback that responds to learner input, providing guidance or aid when necessary or requested.
Experimentation	The learner is provided an opportunity by the course to create and test hypotheses in a digital environment within or through the e-course.	Trial-error or exploration of spaces or concepts in a simulation-based exercise, like in a video game or virtual science lab.
Multiple representations	Representing information in a varied manner (text, video, audio, illustration, etc.), allowing the learner to see the content in different forms that may lead to deeper understanding in total. This can stimulate the learner and allows for a compact method of presenting information that would have required 1000 words.	Graphs, illustrations, simulations or other descriptive visual media that can be used in tandem as to describe various aspects of the same, or similar, concepts.
Mnemonics	Information presented in the form of rhyme acronyms or verse to make recall easier.	Acronyms like LGA (learning goal achievement). Rhyme and verse like songs for remembering the ABCs.
Open answer problem solving	By giving the user what is effectively a blank canvas, the learner is encouraged to produce an answer using the knowledge they already possess.	Avoiding multiple choice, instead allowing for free-text answers in a quiz. Providing questions that do not classify any answers as incorrect.
Discussion boards/forums	By providing a shared space for the learners to share feelings, thoughts and ideas, one facilitates and encourages a collaboration between learners. This is a form of knowledge-sharing that enables peers to both learn from the course and each other.	Setting up a space for comments and discussion in the course's platform/program, or in a social media platform where the course is integrated or accessible.
Roleplay	Encourage novel thinking by providing the learner a set of rules and situations that are unfamiliar or otherwise new. Can also be used as an exercise in practicing new skills or knowledge in a specific context. Can take the form of providing a "role" or character for the learner to play, providing context and opportunity to use knowledge they have learned.	This can occur in a digital space via games and simulations, or by using other communication programs like Zoom, where you can give learners roles and a scene to act out or simulate; like emergency scenarios, historical scenarios, leadership or counselling training, etc.

Portfolio creation and sharing	By making portfolios learners can construct and organize their own knowledge overviews that can be shared, revisited, or used to track progression. Can function as a key event logger for personal/professional development.	Event logs, personal development planning, digital "mood boards" or "clip boards" and other tools for collecting and organizing material.
Collaborative problem solving	Providing spaces for learners to form groups or teams with the intent of solving a problem, going through learning content or creating a product. To facilitate collaborative work there must be a space, digital or otherwise that the learners can inhabit. Collaboration enables more complex problem solving through knowledge/skill sharing that is unavailable when working alone. The activities must be goal oriented as they involve solving a problem.	Collaboratively constructing buildings in Minecraft and similar multiplayer games that may be relevant. Forums and discussion boards, digital meetings, roleplaying a scenario requiring e.g. teamwork or social skills.
Humor	Intentionally added (and non-aggressive, inoffensive, etc.) humor has been indicated to e.g. increase positive relationships with learning environments and tools, improve learning and understanding, as well as recalling information that was presented humorously.	Adding decorative visual elements, video-clips or audio for the purpose of entertaining and engaging learners through humor related to the content. Presenting examples of tasks/information meant to be funny due to e.g. some form of absurdity or relatability.

Step 3

Surveying Learning Goal Achievement

To what extent, and how, do the users feel the e-course was helpful or hindering in their LGA?

Here we include some basic guidelines for producing a short questionnaire to survey the course takers understanding, experience of facilitation and achievement of learning goals. By surveying some of the course takers, you as evaluator are effectively testing if what you found in the previous steps hold any weight. If the course takers found that the goal was understandable; the course facilitated learning; and the learning goals were achieved as a result - that can indicate that the e-course delivered on the desired outcome and purpose of using it. If a facilitator has been experienced as a hindrance, it can be useful to ask the user to further explain why they felt hindered by what was meant to be facilitating. If a facilitator you detected was not experienced at all, it would be useful to ask what they did experience or what they felt was missing.

The guidelines below can be used roughly for creating the form of questions you might want to include in a survey. The questions ought to be constructed in such a way that you can see if the facilitators you detected were in fact experienced by the user, if they work as intended, and what they may have facilitated - whether they facilitated the understanding or the achievement of the learning goals.

To make these questions, we can adapt and include content ("X") from the table, to make it a little easier.

QUESTION (basic example of formulation, based on previous steps):

"Did you experience ("Facilitator" in its specific form) as a means of (relevant form/formulation of "Explanation") helpful to (understand/facilitate/achieve the learning goal) ?"

ANSWERS (examples of general multiple-choice options):

A. Positive (particularly helpful)
B. Positive neutral (a little helpful)
C. Neutral (neither helped nor hindered)
D. Negative (hindered) - (Warrants asking for elaboration)
E. Did not experience (mentioned "facilitator") - (Warrants asking for elaboration)

Example: Seeing as few facilitators were identified in our "case e-course", the survey wouldn't be very long. Each question would need to touch on an aspect of the facilitators found in the course, and inquire about what (if anything) users experienced that they facilitated. Here we have formulated a question about the quiz at the end of our e-course. The quiz has 10 questions. Progress is lost when a question is answered incorrectly, gold stars are awarded when the users answer correctly. The survey question may look something like what is detailed below. If more respondents ticked "D" than "A", then this indicates that the course does not facilitate LGA very well.

"Is receiving negative reinforcement/punishment for answering questions incorrectly, in the form of losing all your progress, helpful in learning infection prevention guidelines?

A. It was very helpful in my learning
B. It was helpful in my learning
C. It was not helpful in my learning
D. It hindered my learning
E. I did not experience any form of punishment/negative reinforcement

V. Iteration Two

Does Workplace E-learning Work?

A new approach and evaluation model for e-learning courses - The LGA Facilitation Model

Preface & Time Scope

Most evaluation models in use today are based on old models that try to measure and trace learning back to courses. This is done through demanding processes that end up "proving" little, because results are affected by factors that are unrelated to the course. These models are also not specifically appropriate for the modern context of digital and remote learning.

Our model offers a more practical and time-efficient process, focused on evaluating e-courses based on their pedagogical soundness. Our approach is based on research about e-learning, enabling/facilitation of learning, adult learners, and learning in the workplace/organizations. E-courses that can be considered "sound" possess pedagogical factors that support learning.

We hope for the process to take about 7 days or less, because long evaluations are rarely fully completed. Incomplete evaluations do not yield very satisfying results, so we want the model to be quick and easy to use. The time scope would probably depend on factors like the evaluators' competence, knowledge of the course and context, need for assistance, and desire to be thorough.

The model consists of 3 steps - also explained in the illustration below:

We first consider the e-courses' learning goals. Secondly, we identify how it facilitates learning. Lastly, we survey the course-takers and analyze findings to see if the facilitators were helpful for learners to understand and achieve the learning goals.

Ambitions & Target Group

We want this model to not only be useful for pedagogues/academics, but also for people working in HR or similar positions that may involve the creation, introduction or administration of e-courses. We also have hopes that this model can be used by smaller organizations that do not have HR- or similar personnel, and producers of e-courses and similar e-learning implementations or tools.

There is a demand to know if e-courses "work", and e-courses are more relevant now (during the COVID-19 pandemic) than ever. From what we can gather, there is no established "best-practice" for e-course evaluation or design, which is why we hope our approach can also help producers design courses in a way that is more theoretically and pedagogically sound.

E-courses and examples

When we refer to e-courses, we are thinking of e-learning content presented in the form of a digital "course" that requires the user to engage (mainly individually) with it. This engagement could involve e.g. clicking through a course like a slideshow, "playing" through various activities, or taking quizzes after being presented information. These e-courses may in other words, take many forms and can cover a wide range of topics, from health and safety to more complex skills like leadership or teamwork. The umbrella term of "e-learning" covers a greater

range of activities and tools.

We will present fictional examples of how the steps in the model could be applied to courses, as we see fit throughout the model.

Illustrations

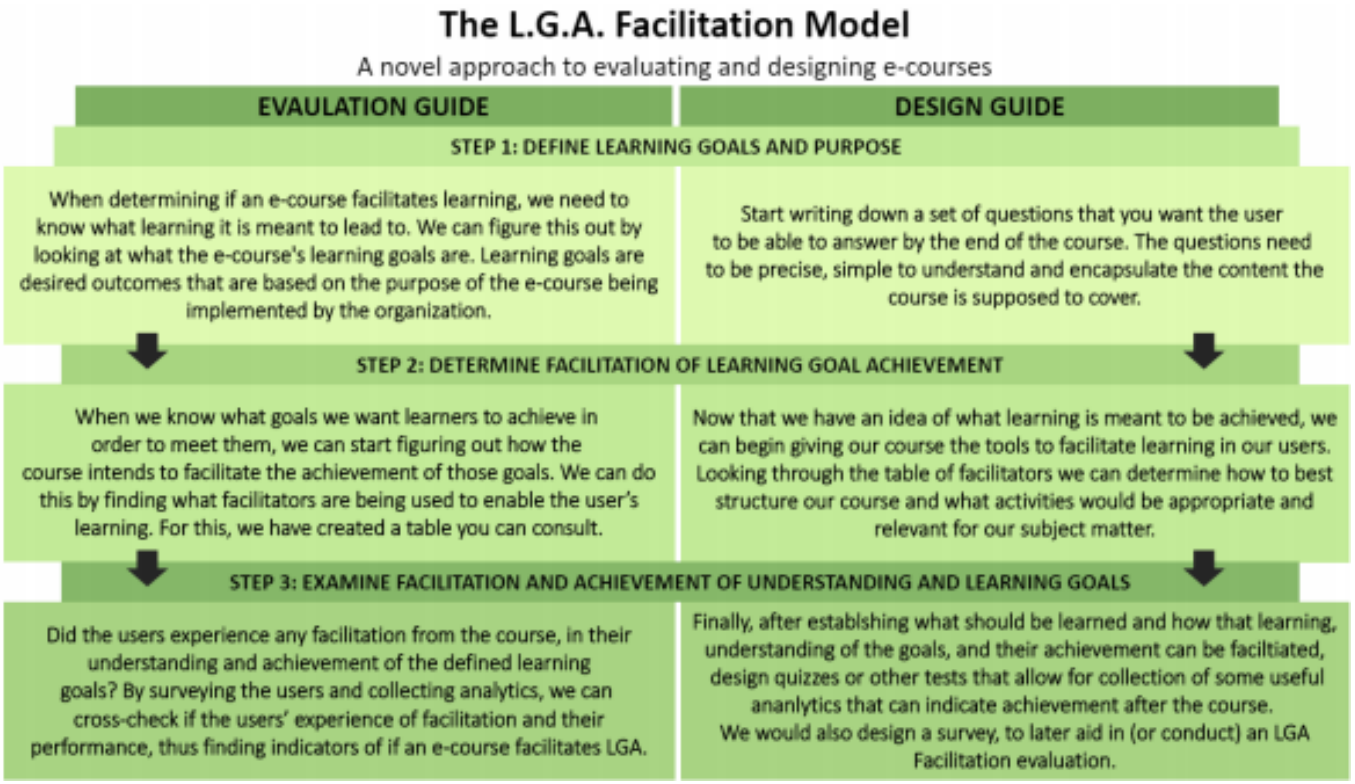


Diagram for Result Interpretation:

Step 1 - Learning Goals

What are Learning Goals, why do we need them for the evaluation?

When interpreting if an e-course facilitates learning, we need to know what learning it is meant to lead to. We can figure this out by looking at what the learning goals for the course are. Learning goals are desired outcomes, based on the purpose of the e-course being used by the organization. Purpose can vary depending on the context of the organization. E.g. the organization's objectives, who the course is made for, and where it is used. In this step we seek to understand and define what the learning goals are, before looking at how achievement of these goals are facilitated in Step 2.

Since the subject matter of e-courses will vary depending on their purpose, goal and target group, the evaluators need to have the competence needed to evaluate the quality of the course's content. In some cases, the evaluator may not possess the relevant competence. In those cases they should consult someone who does, as to determine what "good" content may look like in relation to the course's subject (e.g. if it is factually and structurally sound).

Sometimes learning goals are clearly presented in e-courses. Some present their learning goals at the start. However, if no learning goals are evident, it may be worth asking the course makers what the goals were. If you do not know who made or ordered the course, asking whoever administered or implemented it would be a good idea. If no one knows what the initial learning goals were, it could e.g. be because they are forgotten, or the course didn't have any clear goals to begin with. If that is the case, or if presented learning goals are unclear, you should make your own for the purpose of the evaluation.

Guidelines for goal identification:

These prompts should help you define what goals may be present in an e-course you are evaluating: • What overarching purpose does the e-course serve?

• Does the course explicitly state any learning goals?

○ If so, are those goals relevant or otherwise defined by the desired outcome and purpose of the course?

○ If not, proceed to the next question or make use of the following guidelines for goal making.

• Do you know who requested, designed and/or administered this course? ○ What were their intended learning goals for this course (if any)?

Guidelines for goal making:

Appropriate for design purposes, or if a goal cannot be identified within an existing course. Goals should be formulated in a way that conveys what knowledge/skill the learner is supposed to possess, and preferably also what achievement would look like. They need to be relevant to the subject and context at hand.

Formulating learning goals is often done by posing them as questions. These are examples (in brackets) of learning goal related terms, put into template questions:

- What is [...synergy in a work group…] and how does it work?
- What do you do if […non-authorized personnel enter the building...] (and why do you do so)?
- Why is […team-building...] a responsibility within your role/position, and why is it important?
- How do you handle […a fire evacuation situation...], and what do you do after? - What is the impact of […information leaks from your department...]?

Step 2 - Facilitation

Identifying and understanding facilitators in the course that enable learning.

When the learning goals for the course have been made clear, you can start figuring out what the course does to facilitate the achievement of those goals. This is done by making out what facilitators are being used in the course, to enable the user's learning. The table below is meant to help you detect what facilitators a course may use to enable learning. These facilitators have been categorized hierarchically, so that "structural" and "basic" facilitators are considered as important or fundamental for "activities" to be effective.

To use the table, the evaluator must go through the course before looking at the table, so they can define what facilitators they perceived to be used. For a course to be pedagogically sound, it needs at least one (but preferably several and complementing) facilitators to enable learning. It is hard to say how many facilitators a course might need to be considered "sound."
We would argue that the amount doesn't matter as long as the facilitators that are found were experienced as helpful. That, and more, will be evaluated in Step 3.

Example of how to use the table to identify facilitators:
Jim wants to evaluate an e-course for security guards. He defines the learning goal as "What are the rules for effective fire extinguisher use?." He finds that the course uses mnemonics to aid in user retention of how fire extinguishers work. He also finds multiple representations in form of video and image use. There is a narrative structure of a security guard coming across a fire in his building. The course uses language and cases appropriate to its target audience. The course clearly states what the users are meant to learn. Now that he has identified the course's facilitators, he can go to step 3 and start the process of finding out if those facilitators were helpful for the users.

Structure, content & language *Facilitators that focus on clear and concise ways of formulating content for the learner*		
Facilitator	**Explanation**	**Example(s)**
Narrative	Storytelling and narrative structure are used to present content. This provides context for the learner and makes each learning activity fit together in a cohesive way.	- Presenting a case or familiar situation the learner can recognize or relate to. - Presenting course content through storytelling.
Targeted content	The course contains content for a specific target group, as opposed to being targeted to a wider audience. This type of content needs to be accurate but is more challenging to understand for individuals outside the specialized group. Language and information must be precise, useful and understandable to the target group.	Course content meant (and made understandable) for groups with special skill sets and knowledge (like lawyers), as opposed to more general knowledge for the employees of the wider organization (like fire safety courses).
Sequenced instruction	Gradually providing learners with smaller pieces of information in a specific order, as to acquire a new skill or knowledge. Only allowing access to more content when the learner provides proof of possessing the prerequisites for that content.	- Step-by-step instructions on how to navigate a website, use equipment safely, perform maintenance tasks, etc. - Structured slides in an order that does not allow for skipping slides or progressing without "completing" certain steps.

Basic facilitators *These are considered fundamental for structuring and enabling activities and other facilitators.*		
Facilitator	**Explanation**	**Example(s)**
Clear focus on learner outcome	Can motivate the learner, as it allows them to intentionally try to achieve the goals and reach the desired learning outcome. Provides context and meaning to the learning material presented in the course.	- Stating learning objectives at the beginning and end of the course. - Providing overviews that show progress in completing partial and main goals. - Providing reminders of the purpose of (or incentive behind) the course throughout its content.
Highlight Progression	Giving the learners a clear sense of progression. This can be done by rewarding the learners after completing objectives or informing the user how close to the end they might be.	- Using progression bars in the course. - Rewards or other acknowledgement that the user completed an objective or part of a course.
Digital scaffolding	The learner is supported through prompts, encouragement, and guidance when in need of assistance, to achieve a certain goal or going through the content of an exercise. This is provided until they have developed the necessary skills/knowledge to go through the exercise alone.	- Automated feedback prompts that respond to learner input, providing guidance or aid when necessary or requested. - Avatars, integrated narrative/case prompts, etc. meant to provide relevant and specific aid in tasks.
Multiple representations	Representing information in a varied manner (text, video, audio, illustration, etc.), to let the learner view the content in different ways. This can stimulate the learner and is a compact and varied way to present information, allowing for deeper understanding.	Graphs, illustrations, simulations or other descriptive media that can be used together to describe different perspectives or parts of concepts.
Positive OR Negative reinforcement	Rewarding the learner when they e.g. provide correct answers, to encourage them to keep it up. OR Punishing the learner when they e.g. fail a task, to discourage them from doing so again. (It should be noted that rewards are indicated to be more effective than punishment in most contexts.)	- Receiving immediate positive feedback upon providing a correct answer in an exercise or quiz, in the form of an award or prize. OR - Needing to start a task over again from scratch due to any errors, and e.g. reducing the number of attempts allowed to complete a task.
Gradual steps	Presenting knowledge in an order that lets learners gradually build a deeper understanding and mastery of a topic. Requiring the learner to use what they learn about a topic to then understand new information about the same topic.	Gradual increase in difficulty in a row of exercises, or e.g. game-like tasks with a narrative progression, where the tasks become more and more complicated.
Gamification	Content or activity presented in a "gamified" way to promote engagement and recall. The purpose would be to engage learners to learn through play and challenges related to the subject matter of the course.	Examples of gamified course features include immediate feedback and results, clear progression and reward systems, as well as aspects of narrative storytelling, role play, experimentation, creative problem solving, puzzles, quizzes, competition, etc.

Activities *-Facilitators that require or encourage active engagement with course content to reach goals.*		
Facilitator	**Description**	**Examples**
Experimentation	The learner is provided an opportunity by the course to create and test what they have learned, in a digital environment or simulation.	Learning through trial-error or exploration of specific problems, situations or concepts in simulation-based exercises, like in a video game or virtual science lab.
Repetition	Formulating content in different ways throughout the course to improve memory retention or repeating certain key lessons and facts to make sure the learner picks up on them and their importance.	- Repeatedly presenting important facts in a simple way, in different (but relevant) parts of the course. - Quizzes and tasks that allow the learner to practice/use what they have learned and/or make use of key resources they have access to.
Open answer problem solving	By giving the user room to make their own answers and solutions, without being presented options to choose from, the learner is encouraged to produce answers using the knowledge they already have.	Avoiding multiple choice and instead allowing for free-text answers in e.g. quizzes or for questions with no "correct" answers.
Discussion	By providing a space for learners to share feelings, thoughts and ideas, you facilitate and encourage interaction between learners. This encourages knowledge-sharing, and enables peers to both learn from the course and each other.	Setting up a space for comments and discussion in the course's platform/program, or in a social media platform where the course is integrated or accessible.
Roleplay	Learners engage with each other in real time in a provided fictional situation. This provides a space to practice and use what they have learned in different ways. The learner can also be assigned a "role", where they need to complete tasks alone according to the role.	This can e.g. occur via games and individual tasks, or by collaboration using communication programs, where you can give learners roles and a "scene" to simulate various scenarios, e.g. handling emergency or social situations, scenarios for practicing leadership or counselling skills, etc.
Portfolio creation and sharing	By making portfolios learners can construct and organize knowledge. These can be shared, revisited, updated and/or used to track progression. These can function as key event logs for personal/professional development.	Event logs, personal development planning, digital "mood boards" or "clip boards" and other tools for collecting and organizing material.
Mnemonics	Information presented in the form of rhyme, acronyms or verse to make repetition and recall easier.	- Rhyme and verse like songs for remembering the ABCs. - Acronyms like PASS (Pull, aim, squeeze and sweep) for fire extinguisher use.
Collaborative problem solving	Learners form groups or teams for the sake of solving a problem or making a product (like a presentation). Collaborative work needs a "space" the learners can use as a platform. It enables complex problem solving through knowledge and skill sharing that is unavailable when working alone.	- Forums and discussion boards, digital meetings, roleplaying a scenario requiring e.g. teamwork or social skills. - Constructing buildings together in Minecraft and similar multiplayer games that may be relevant.

Step 3 - Achievement

Surveying course takers and analyzing results to evaluate pedagogical soundness

In Step 1 we defined the learning goals and the purpose of the course. In step 2 we found out what the course does to facilitate the achievement of the learning goals. Now we need to know if the users experienced any facilitation of their understanding and achievement of those goals. We can do so by surveying the users and analyzing data. Relying on the user's ability to self-reflect may not be the most reliable method on its own, so to strengthen our findings we need useful analytics. By using those we can cross-check if the users' experience of facilitation overlaps with their achievement.

Achievement analytics and data:

Useful analytics should primarily indicate an achievement of the relevant learning goals. This might be analytics from a learning platform where the course is integrated, or results from users' completed tasks or quizzes.

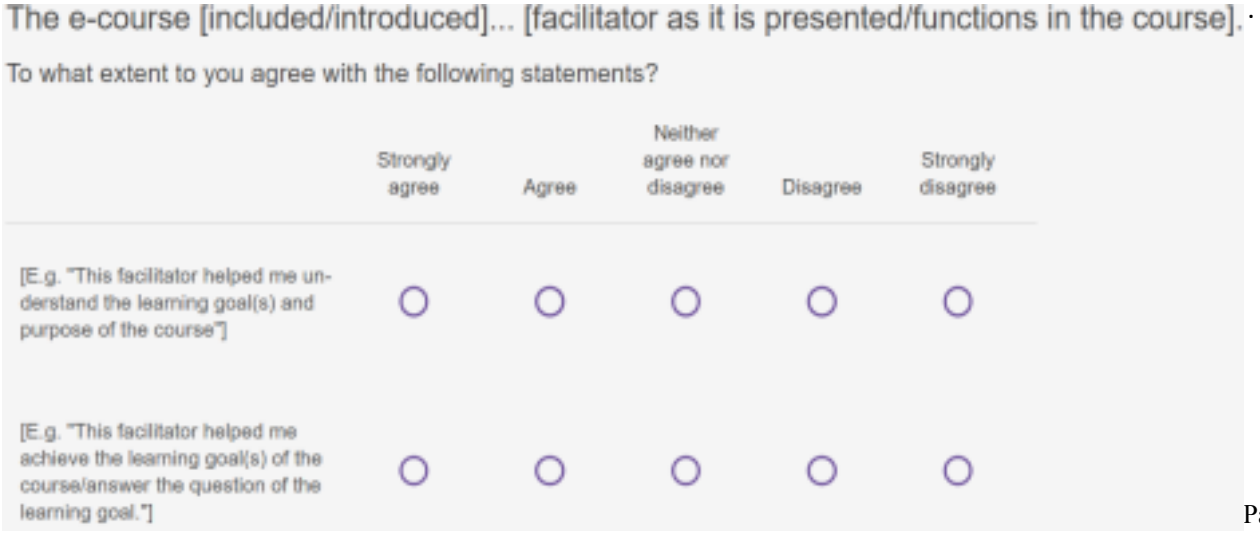
- Quizzes and tests do NOT "prove" learning as a result of the course, but rather that the users have what it takes to pass the test, and therefore functions as a decent indicator of achievement. However, users may achieve course related learning goals without having accurately understood the learning goals or having been facilitated by the course. Hence cross-checking is considered useful.

- Amount of time spent and the number of attempts made to complete tasks could be useful analytics to see if a user rushed through a course or got stuck at any point.

All of these analytics when viewed on their own don't necessarily indicate or prove anything. However, analyzing them in context of one another and the survey data, can paint you a more in-depth picture of whether a course facilitated understanding of the learning goals and their achievement.

Survey format and survey takers:

This is an example template for how to make survey questions that specifically address the facilitators in the course. This format also allows users to submit their experience of both the facilitation of understanding and achievement, within one survey. How much users agree/disagree indicates how helpful/unhelpful a facilitator was, as well as how users experienced the facilitator and its subject/content to be clear and relevant. In other words; this format allows for the evaluation of all three major factors that can indicate a pedagogically sound course


The e-course [included/introduced]... [facilitator as it is presented/functions in the course].

To what extent to you agree with the following statements?

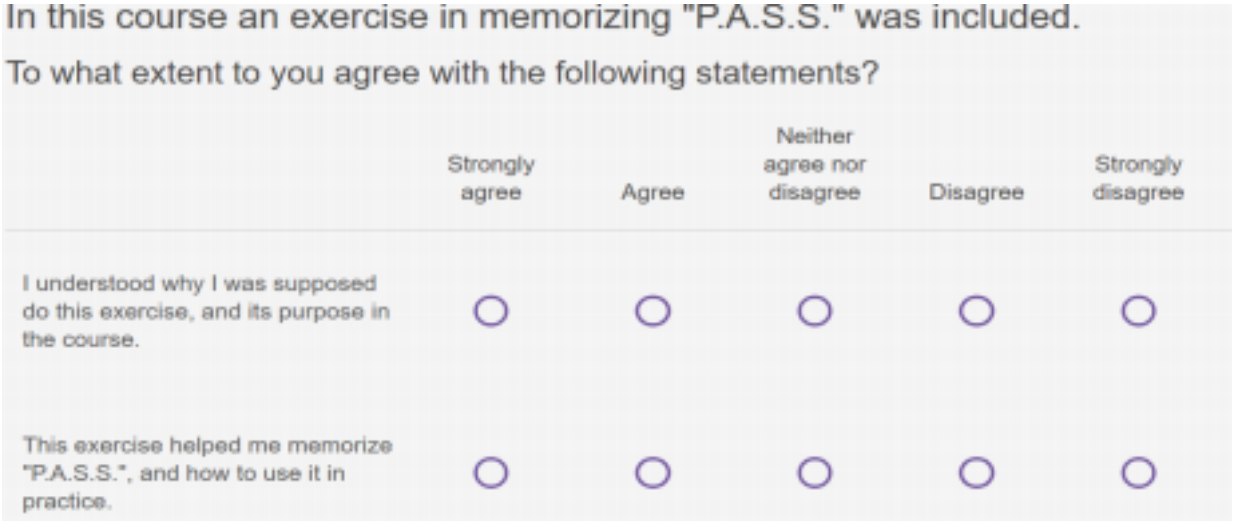
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
[E.g. "This facilitator helped me understand the learning goal(s) and purpose of the course"]	○	○	○	○	○
[E.g. "This facilitator helped me achieve the learning goal(s) of the course/answer the question of the learning goal."]	○	○	○	○	○

Only trends within the collected data are of interest. It should also be noted that the selection and number of survey takers must be representative of the course's user group and size, to make sure results are as reliable as possible.

For the purposes of this evaluation, being able to identify the survey takers is not necessary. Data and analytics should always be treated responsibly, in line with data protection laws and regulations.

Example survey question

Using the example from Step 2, about "Jim" who detects the use of the mnemonic "PASS", to facilitate memorization of how to use fire extinguishers. In his survey, the template for creating survey questions could be used accordingly:


In this course an exercise in memorizing "P.A.S.S." was included.

To what extent to you agree with the following statements?

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I understood why I was supposed do this exercise, and its purpose in the course.	○	○	○	○	○
This exercise helped me memorize "P.A.S.S.", and how to use it in practice.	○	○	○	○	○

Here the facilitator is specified according to the purpose of it being used, and by including the mnemonic acronym that was meant to be memorized. It is more important to formulate relevant questions than it is to adhere strictly to the format in the example survey question template.

Interpretation of results:

After we have gathered analytics and survey results, we want to compare both sets of data using the *Diagram for result interpretation* presented earlier. By using this diagram, we can see what the results indicate, by reflecting on where in the diagram the evaluation results might "fit".

If users conveyed understanding (U) and achievement (A) of the learning goals, and experienced facilitation (F), that means the course facilitated achievement of understandable learning goals. This is the ideal result, which would "fit" in the middle section of the diagram. If your data is missing indications of any of these (U, A and F) then that means your results would land on one, or in between two, of the circles in the venn diagram. For example, your results may indicate that users' learning was facilitated and they achieved the learning goals, but did not understand them. Then your results would fit in between the F and A circles on the diagram.

Results that do not fit in the middle section indicate that the course may not be entirely pedagogically sound. It might be e.g. falling short in its attempts at facilitation, contain irrelevant/unnecessary facilitators, or goals that in practice do not align with the purpose of the course. Though a lot of courses may not fall into the middle, it does not mean that the course is necessarily "bad" and should be discarded, but rather that there is room for improvement in the relevant areas.

VI. The LGA Facilitation Model Prototype

Workplace E-learning, does it Work?

A New Approach to Evaluating E-learning Courses with Implications for Design

The Learning Goal Achievement (LGA) Facilitation model is a prototype evaluation model, with implemented design guidelines.

The purpose of the model is to help designers and administrators of e-courses, as well as HR and pedagogues, to evaluate if an e-course facilitates the users' achievement of learning goals.

The model aims to ensure that an e-course is pedagogically sound. It is intended for both evaluation and design of e-courses, according to the same principles.

The evaluation process is the focus of the model, and is meant to be completed as instructed. A more comprehensive design guide may be developed in the future.

The design process is intended to be followed by an evaluation. Guidelines for design therefore transition into the evaluation guide.

The illustrated model summarizes what the evaluation and design guides involve.

We define e-courses as e-learning content presented as digital "courses," meant for training/learning of some kind, requiring the user to engage with it. Engagement may involve e.g. clicking through course pages or taking quizzes after a presentation of content.

E-courses may take many forms and be used to cover a wide range of topics (e.g. health and safety, leadership and teamwork.) Hence, our model is intended to be flexible in its application.

The LGA Facilitation Model

Evaluation guide	Design guidelines
Step 1: Define the Learning Goals and purpose of the course	
To see if an e-course is "pedagogically sound", we need to know what course takers are supposed to learn from it. To do that, we define its Learning Goals. Learning goals (LGs) are desired outcomes, based on the purpose of the course. Who the course takers are also matters. • If you see no obvious goals, you must ask someone who might know. • If no one knows, you should design LGs that fit the course as it is.	To make your e-course "pedagogically sound", and align with the purpose of it being made, you need to define Learning Goals (LGs). They need to be precise, easy to understand, and cover what the learner is supposed to get out of it. Here are some ways to do that: • Form questions you want the course taker to be able to answer, • use learning verbs to define what the user should be able to do, • or define what achievement of the course purpose looks like.
Step 2: Identify and use "facilitators" from the course to make a survey	
Once clear goals are defined, we examine how the e-course facilitates the achievement (A) of those goals. Does it enable the desired Learning Goal Achievement (LGA), by using pedagogically sound design? Go through the course and identify what "facilitators" it contains. To make that easier we have made a table of examples you can use. Once those are identified you create survey questions about them. We have included question-templates for survey design.	Once you have defined precise and relevant learning goals, decide on how to facilitate the course takers' Learning Goal Achievement (LGA). Decide on what types of "facilitators" you want to include in the course. Look to our table of examples for inspiration and information. Reflect on how they should fit together and cover the LGs, and then start forming survey questions about them. We have included survey question-templates.
Step 3: Survey course takers and triangulate your collected data	
To get results that indicate the e-course's pedagogical soudness, you need to "triangulate" three types of data. • You have collected the first data, your defined LGs and facilitators. • The next type will be survey data from the course takers, by using your questions from Step 2 about facilitators and relevant LGs. • Finally, you look at relevant "learning analytics" (if possible). Then use the included Venn diagram about Understanding, Facilitation and Achievement of LGs, to interpret your data and finish your evaluation.	After the e-course has been finished and completed by the course takers, it is important to follow up with an evaluation. Use your survey questions from Step 2, and make sure they are accurate. It is a bonus that the survey provides repetition for the course takers, which is beneficial for learning. (As long as the evaluation is relatively close to the course in time.) Follow the instructions in Step 3 in the Evaluation Guide to proceed.

Step 1 Define the learning goals and purpose of the course

Evaluation

To see if an e-course facilitates learning, it is necessary to know what learning the e-course is meant to lead to.

Learning goals are desired outcomes, based on the purpose of the e-course being used by the organization.

These prompts can help you **define what goals may be present** in an e-course:

- Does the e-course explicitly state any learning goals?
  - If so, are those goals **appropriate** or otherwise related to the **purpose** of the e-course?
- What overarching **purpose** does the e-course serve?
- Do you know who requested, designed, and/or administered this e-course?
  - What were their intended learning goals for this course (if any)?

If there are no goals, design your own for the purpose of the evaluation.

Purpose and Appropriateness:

- **Purpose**: How learning goals fit the organization's intent and strategy behind using the e-course. Overarching goals, regarding learning and competence development, should also align with the e-course.
- **Appropriateness**: For the target group to benefit from the course, the content must be relevant and understandable. Consulting your user group is a way of making sure learning goals are relevant and align with their current knowledge.

One way to **identify the purpose of a learning goal** is to ask " WHY?", and answer "BECAUSE." This lets you see how the course is linked to relevant strategies and goals. Consulting someone who knows and understands your organization's strategy and goals can ensure that your reasoning is accurate.

Example:
The learner should remember the company's ethical guidelines. WHY?
- BECAUSE it is meant to lead to more ethical practices. WHY?
- BECAUSE the company wants to encourage workers to be more aware of their work's ethical implications. WHY?
- BECAUSE the company has a zero corruption policy.

If no purpose is found, continue evaluating with this in mind.

Design

Guidelines for goal making:

Appropriate for design purposes, or if a goal cannot be identified.

- Learning goals should clearly state what the users are supposed to learn.
- They should clarify what achievement would look like.
- They need to be **appropriate** to the user group, and related to a **purpose.**

Learners should be encouraged to actively reflect on learning goals.

Learning goals can be categorized according to the complexity of the task needed to achieve them.
Looking at **Bloom's Taxonomy**, lower complexity acts as a prerequisite for higher complexity, meaning the learner needs a grasp of the basics before achieving more complex tasks.

Determine what level of complexity is **appropriate** for your user group. Depending on the scope and **purpose** of the course, learning goals should be suitably complex to include the appropriate content and activities.

When making learning goals you ought to describe the desired learning outcome in noun form, and with the objectives expressed in verb form:

- **E.G.** "The learner should UNDERSTAND and REMEMBER the ETHICAL GUIDELINES"

Bloom's Taxonomy (Andersen & Krathwohl, 2001)

Step 2 Identify and use "facilitators" from the course to make a survey

Evaluation

When the **learning goals** of the e-course have been defined, examine what the course does to facilitate achievement of those goals. Identify the **"facilitators"** the e-course possesses.

Facilitators are features, tasks, and activities or exercises, in the e-course. These may aid users of the course in their achievement of learning goals, if they are **pedagogically sound.**

The following table is meant to help you identify and define facilitators. They are categorized hierarchically in the table. "Structural" and "basic" facilitators are somewhat fundamental for the effectiveness of "activities".

Using the Facilitator table

Go through the course before looking at the table. Define the facilitators you perceived. If you are unsure, or are having trouble identifying or defining the facilitators, consult someone with expertise in learning or e-course design.

Survey

After identifying the facilitators, create a survey that may **indicate if the facilitators work**. This is meant to be used in Step 3, to examine the pedagogical soundness of the e-course.

Provided in the following slides is an **example template for survey design**. It provides guidance regarding the format and ways of specifically addressing the facilitators in the e-course.

Remember to make sure your survey is reliable, and to test it on a large part of the user group. Take your time, and cooperate with colleagues or other stakeholders to check the survey, if possible.

Design

By including facilitators you are creating a pedagogical framework for the presentation of learning goal-relevant content. It is important to consciously choose facilitators, and consider their **appropriateness** for your user group.

When choosing and designing facilitators, remain aware of what the facilitators' relevant **learning goals** and **purposes** are.

They should inform how you choose to structure the course and formulate content and activities.

You may also make use of the Facilitator table, to see what facilitators may be suitable for your e-course, or merely to gain inspiration.

For an e-course to be **pedagogically sound**, it must have sound facilitators, and preferably several compatible facilitators. However, users may feel overwhelmed if there are too many facilitators that require their engagement.

A rule of thumb is to stick to approximately **5 activities per course**.

Keep your use of language in mind. It must be **appropriate** for the user group, and **accurate to the learning goals**. Write only what is necessary, to precisely convey information the learners need, for them to **achieve the learning goals.**

Getting a second opinion or advice on choosing which facilitators to use is always a good idea, as it provides valuable feedback in the design process.

Make use of experts in relevant subject matters, and varied competence

- Although the table is meant to be easy to understand and read, it is still a good idea to consult someone with **pedagogical expertise**. They may be able to identify the various facilitators in a given e-course, and aid in the survey design, to **ensure reliability.**
- When designing e-courses, consulting relevant experts lets you double check if your included facilitators are **appropriate** for the user group, content and subject matter.
  Including experts from various fields in the design process can altogether improve the end product.

Step 2 Survey design

This is a template for survey format and statements. It allows users to submit their experience of both the **facilitation** of **understanding** and **achievement**, within one survey.

In other words; the format surveys the three major factors that can indicate a pedagogically sound course.

How much users **agree or disagree** (in total) should indicate how helpful a facilitator was, as well as how clear and relevant it was perceived to be.

Do not include or define learning goals in the survey. You want to know if the users understood the goals, without being reminded of them in the survey.

The e-course [included/consisted of] ... [facilitator as presented/functioning in the course]. 4

To what extent to you agree with the following statements?

(Example statements, to gauge the Facilitation of Understanding and Achievement of Learning Goals:)

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
"I found [this exercise/task/feature] helpful to my understanding of why I am taking the course."	○	○	○	○	○
"[This exercise / task / feature] was useful for my learning of [the subject matter]."	○	○	○	○	○

Example

An evaluator named **"Jim" has identified the use of mnemonics as a facilitator** in an e-course about fire extinguisher use. This facilitator is present in the form of an acronym, **"PASS"** (Pull, Aim, Squeeze, Sweep), as a way of making the information easier to recall.

The survey could be designed like the one presented to the right. He can use the template to **formulate statements to evaluate the facilitator by**.

The facilitator in question has to be specified according to the reason it is used. In this case, to aid in the memorization of content.

By including the acronym and addressing it without a reminder of its meaning, the users must recall it, if they can.

Define the facilitators accurately and formulate relevant statements. This is more important than it is to adhere strictly to the survey template.

In this course, an exercise in memorizing "P.A.S.S." was included.

To what extent do you agree with the following statements?

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I understood why I was supposed to do this exercise, and its purpose in the course.	○	○	○	○	○
This exercise helped me memorize "P.A.S.S.", and how to use it in practice.	○	○	○	○	○

Structure, content & language

5

Facilitators that focus on clear and concise ways of presenting content to the learner

Facilitator	Explanation	Example(s)
Narrative	Storytelling and narrative structure are used to formulate and present content. This provides context for the learner and each learning activity fits together in a cohesive way.	- Presenting a case or familiar situation the learner can recognize, relate to or inhabit. - Telling a story throughout the presentation of content.
Targeted content	The course contains content for a specialized target group, as opposed to being targeted to a wider audience. This type of content needs to be accurate but is more challenging to understand for individuals outside the specialized group. Precise and appropriate language and information must be useful and understandable to the target group.	- Course content meant (and made understandable) for groups with special skill sets and knowledge (like lawyers), as opposed to more general knowledge for the employees of the wider organization (like fire safety courses).
Sequenced instruction	Gradually providing learners with smaller pieces of information in a specific order, as to acquire a new skill or knowledge. Only allowing access to more content when the learner provides proof of possessing the prerequisites.	- Step-by-step instructions on how to navigate a website, use equipment safely, perform maintenance tasks, etc. - Structured slides in an order that does not allow for skipping slides or progressing without “completing” certain steps.

Basic facilitators

6

These are considered fundamental for structuring and enabling activities and other facilitators.

Facilitator	Explanation	Example(s)
Clear focus on learner outcome	Stating goals for the learner as to encourage them to reach for the desired outcome. Can motivate the learner, as it allows them to intentionally try and achieve goals. Provides context and meaning to the learning material presented in the course.	- Stating learning objectives at the beginning and end of the course. - Providing overviews that show progress in completing partial and main goals. - Providing reminders of the purpose of (or incentive behind) the course throughout its content.
Digital scaffolding	The learner is supported through prompts, encouragement, and guidance when in need of assistance, to achieve a certain goal or going through the content of an exercise. This is provided until they have developed the necessary skills/knowledge to go through the exercise alone.	- Automated feedback prompts that respond to learner input, providing guidance or aid when necessary or requested. - Avatars, integrated narrative/case prompts, etc. meant to provide relevant and specific aid in tasks.
Gamification	Content or activity presented in a "gamified" way to promote engagement and recall. The purpose would be to engage learners to learn through play and challenges related to the subject matter of the course.	Examples of gamified course features include immediate feedback and results, clear progression and reward systems, as well as aspects of narrative storytelling, role play, experimentation, creative problem solving, puzzles, quizzes, competition, etc.

Basic facilitators

7

Facilitator	Explanation	Example(s)
Multiple representations	Representing information in a varied manner (text, video, audio, illustration, etc.), allowing the learner to see the content in different ways, this can lead to a deeper understanding of the content. This can stimulate the learner and allows for a compact and varied method of presenting information.	Graphs, illustrations, simulations or other descriptive media that can be used together to describe various aspects or perspectives of the same, or similar, concepts.
Gradual steps	Presenting knowledge in an order that lets learners gradually build a deeper understanding and mastery of a topic. Requiring the learner to use what they learn about a topic to then understand new information about the same topic.	- Gradual increase in difficulty in a row of exercises, or e.g. game-like tasks with a narrative progression, where the tasks become more and more complicated.
Highlight Progression	Giving the learners a clear sense of progression. This can be done by rewarding the learners after completing objectives or informing the user how close to the end they might be.	- Using progression bars in the course. - Rewards or other acknowledgement that the user completed an objective or part of a course.
Positive OR Negative reinforcement	Rewarding the learner when they e.g. provide correct answers, to encourage them to continue to do so. **OR** Punishing the learner when they e.g. fail a task, to discourage them from continuing to do so. (It should be noted that rewards have been indicated to be more effective than punishments in most contexts.)	- Receiving immediate positive feedback upon providing a correct answer in an exercise or quiz, in the form of an achievement or prize. OR - Needing to start a task over again from scratch due to any error in its completion, and e.g. having their allowed number of attempts at the task reduced.

Activities

8

Facilitators that require or encourage active engagement with course content to reach goals.

Facilitator	Explanation	Example(s)
Experimentation	The learner is provided an opportunity by the course to create and test what they have learned, in a digital environment or simulation.	Learning through trial-error or exploration of specific problems, situations or concepts in simulation-based exercises, like in a video game or virtual science lab.
Repetition	Formulating content in different ways throughout the course to improve memory retention or repeating certain key lessons and facts to make sure the learner picks up on them and their importance.	- Repeatedly presenting important facts in a simple way, in different (but relevant) parts of the course. - Quizzes and tasks that allow the learner to practice/use what they have learned and/or make use of key resources they have access to.
Open answer problem solving	By giving the user room to make their own answers and solutions, without being presented options to choose from, the learner is encouraged to produce answers using the knowledge they already have.	Avoiding multiple choice and instead allowing for free-text answers in e.g. quizzes or for questions with no “correct” answers.
Discussion	By providing a space for learners to share feelings, thoughts and ideas, you facilitate and encourage interaction between learners. This encourages knowledge-sharing, and enables peers to both learn from the course and each other.	Setting up a space for comments and discussion in the course’s platform/program, or in a social media platform where the course is integrated or accessible.

Activities

Facilitator	Explanation	Example(s)
Mnemonics	Information presented in the form of rhyme, acronyms or verse to make repetition and recall easier.	- Rhyme and verse like songs for remembering the ABCs. - Acronyms like PASS (Pull, aim, squeeze and sweep) for fire extinguisher use.
Roleplay	Learners engage with each other in real time in a provided fictional situation. This provides a space to practice and use what they have learned in different ways. The learner can also be assigned a "role", where they need to complete tasks alone according to the role.	This can e.g. occur via games and individual tasks, or by collaboration using communication programs, where you can give learners roles and a "scene" to simulate various scenarios, e.g. handling emergency or social situations, scenarios for practicing leadership or counselling skills, etc.
Portfolio creation and sharing	By making portfolios learners can construct and organize knowledge. These can be shared, revisited, updated and/or used to track progression. These can function as key event logs for personal/professional development.	Event logs, personal development planning, digital "mood boards" or "clip boards" and other tools for collecting and organizing material.
Collaborative problem solving	Learners form groups or teams for the sake of solving a problem or making a product (like a presentation). Collaborative work needs a "space" the learners can use as a platform. It enables complex problem solving through knowledge and skill sharing that is unavailable when working alone.	- Forums and discussion boards, digital meetings, roleplaying a scenario requiring e.g. teamwork or social skills. - Constructing buildings together in Minecraft and similar multiplayer games that may be relevant

Step 3 Survey course takers and triangulate collected data

Evaluation

Data and survey results must be interpreted in order to achieve an evaluation result that indicates how **pedagogically sound** an e-course is.

Three forms of data should be triangulated, if possible.

- First, **survey your course takers**, using the findings and template in Step 2.
- If **analytics** are available, see the information below about using them.
  - They may allow for "cross-checking" e.g. if survey data about facilitation align with analytic data about achievement.
- All evaluation and design work in **previous steps** should be taken into consideration, when **interpreting data.**

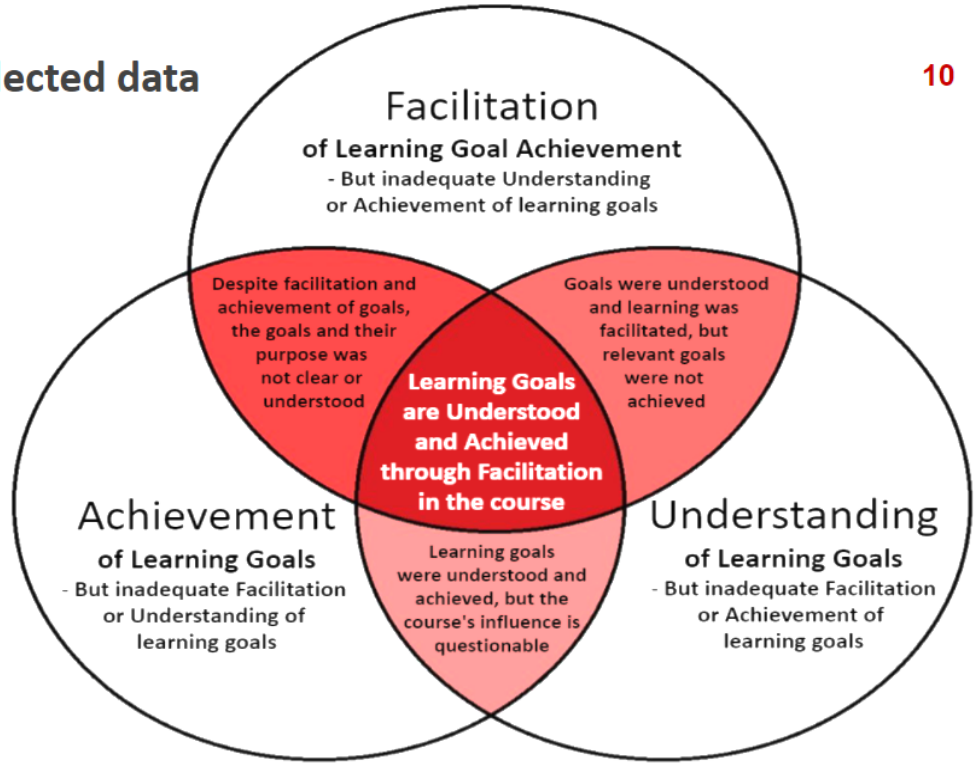
Design

Before the course is put to use, implement relevant tools, tasks, tests, or other ways to **gain relevant analytics.**

The analytics must relate to the learning goals, facilitation of achievement, and provide data that will help you when you evaluate.

Evaluation allows for insurance of **pedagogical soundness,** as well as discovery of potential room for improvement, or need for follow-up.

Follow the evaluation guidelines, and **interpret results** accordingly.



Analytics

Analytics should indicate **understanding, facilitation and achievement** of the learning goals, while being reliable and accurate in their measurements.

Examples of potentially useful analytics: Activity data over time, quiz results and number of attempts, amount of completed voluntary tasks, progress overviews, or drop-out rates.

All data that concerns the users, must be collected and used according to the General Data Protection Regulations (GDPR).

Triangulating several types of analytics with the survey data, and documented work from previous steps, can aid when interpreting results. However, do use them consciously.

Diagram for Result Interpretation

The interpretation of results must be done according to the individual reasoning of the evaluator(s), as practices and results may vary widely in different contexts.

If all data implies that **the majority of users** experienced sound facilitation **(F)**, and understood **(U)** and achieved **(A)** the learning goals, this the ideal result in the middle section of the diagram. This indicates **the facilitation of LGA was successful**, and the e-course is **pedagogically sound.**

If a set of data is missing indications of **F**, **U**, **A**, or several of these factors, that means the corresponding results would land elsewhere in the diagram. Such results indicate that the course is not satisfyingly pedagogically sound, due to the lack of overlap.

Example: If your results indicate **F** and **A**, but no **U**, the results would fit in the F and A overlap in the diagram. The course may e.g. have failed to communicate its goals and purpose, or its goals do not align with any relevant purpose. This does not mean the course should be discarded, but rather that there is room for improvement in the relevant areas.