Examining Instructors' Roles in Facilitating Students' Learning Process in Pedagogical Information and Communication Technology Massive Open Online Course

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This study examines how course instructors facilitate students' learning in the Pedagogical Information and Communication Technology (ICTPED) Massive Open Online Course (MOOC) aiming to develop professional digital competence in pre-service and in-service teachers in Norway. It also provides an insight into how students' agentic engagement in learning may affect the course instructors' guidance. Students' online meetings with the course instructors and students were observed and recorded. The meetings aimed to develop students' understanding of the examination assignment. The data (4.5 hours video recordings) analyzed by the method of interaction analysis revealed that the instructors performed four pedagogical functions: (1) setting up the learning process, (2) reifying students' ideas;(3) assisting students in developing their conceptual understanding; and (4) summarizing and structuring students' understanding about target concepts. These pedagogical functions evolved out of mutual collaboration of the instructors and students. The students' agentic engagement in learning was visible when they took the initiative to explicitly share their ideas related to their examination assignment. Instructors' agency in guiding came into play when addressing students' ideas and questions emerged during the interaction process. Students' agentic engagement in learning shaped the course instructors' pedagogical functions and enhanced their agency. In doing so, the dialectical interplay between the students' and course instructors' agency comes to the fore as an essential aspect of learning and teaching in online environments.

Keywords: instructors' guidance functions, students' agentic engagement, online meeting, learning and teaching, agency. P.Ya. Galperin.

1. Introduction

This study examines the online course instructors' role facilitating participants' learning process in the ICTPED MOOC offered by a Norwegian University College aiming to develop professional digital competence in pre- and in-service teachers. The study also provides an insight into how participants' agentic engagement in learning may affect the course instructors' guidance. Several studies suggest that instructors perform approximately four roles while facilitating students' learning in online environments: managing (setting agenda, managing, leading, and directing interactions), pedagogical (promoting interactions to develop students' understanding of the target concepts), social (creating a friendly environment and promoting group learning), and technical (facilitating students' engagement with digital technologies [1—3]. Instructors, focusing on adopting a facilitating role, emphasize an experiential, collaborative, and problem-solving nature of the learning processes, while those who prioritize teaching as a knowledge transmission direct their attention mostly to content delivery [4—6]. This distinction might be contested, but it aptly describes instructors' role in the so-called two types of MOOCs: cMOOCs and xMOOCs. The initial cMOOCs, also called connectivist MOOCs, emphasized network creation, learner autonomy, and interaction among learners [7, 8] and instructors are ex-

pected to act more like facilitators by helping learners to connect to and learn from each other [9]. On the other hand, "xMOOCs are built as an extension of the conventional campus course" [8] providing more structured learning resources such as video lectures, reading materials, automated quizzes, and assignments [8, 10, 11]. Instructors take the role of knowledge/content experts in xMOOCs by delivering premediated contents for learners [12, 13]. However, facilitating students' learning in online environments, including MOOCs, may depend upon how students present and (re)position themselves in particular learning events (i.e., online meetings), and in doing so, manifest their agency.

By taking the Vygotskian perspective, students' agency is understood as an ability to propel themselves forwards, recognizing and responding to the demands in tasks, and, with increasing competence, repositioning themselves within the epistemic domain (Edwards, 2015). Such a perspective has been adopted in other studies that discuss how students may develop their agency while learning online. For example, [14] found that learners were able to address their agentic needs by engaging in interactions with video resources in the ICT MOOC. The video resources in the ICT MOOC offered an approach for students to engage in online learning and, in doing so, may have contributed to enhancing their agency. Repositioning themselves as active agents in the epistemic educational practices in MOOCs, students might enhance their digital agency [15]. Therefore, in online learning, instructors' roles might become "the guide on the side" rather than "the sage on the stage" [1, 16]. In this sense, instructors' roles to facilitate students' learning are contingent upon how students (re)position themselves in learning activities while making their needs explicit and responding to the arising demands. However, instructors are rarely engaged in facilitating students' learning due to a massive number of participants[8, 17], and their guidance remains mostly underresearched [18]. Several studies have expressed the need to examine a course instructor's role to facilitate online learning [19, 20]. This study addresses this gap by examining instructors' facilitating of students' learning in the synchronous online meetings in the ICTPED MOOC aiming to help students to solve the examination task.

The following research questions are addressed:

RQ1: How did the course instructors facilitate students' learning in the ICTPED MOOC during online meetings?

RQ2: How did the students' engagement in online learning affect the course instructors' guidance?

2. Instructors' roles in online learning environments

Several studies outline different roles that an online course instructor performs to facilitate teaching-learning practices[1, 21−23]. Online course instructors may perform a pedagogical role [2, 24], managerial role [1, 25], or facilitating role [26]. The pedagogical role, for Maor [24], is concerned with micro-level practices such

as stimulating discussion, raising questions, promoting interactions, providing feedback, synthesizing students' comments, and referring to resources. Other studies [2, 22, 27] have found that the pedagogical role concerns both micro-level practices as well as the designing of those practices (designing instructional strategies, developing appropriate resources for learning). The managerial role [1, 25] includes agenda setting, recordkeeping, and initiating and facilitating interactions. It focuses on how to engage participants in the learning process. Instructors' facilitating role is concerned with welcoming students, responding to students' questions or needs, providing feedback, and promoting interaction [26].

In the MOOC context, a course instructor's role may differ according to the types of MOOCs [12, 13]. Literature shows, besides the existing two types of MOOCs (cMOOCs and xMOOCs), other types of MOOCs emerging in terms of learning functionality such as tMOOCs (transfer MOOCs), sMOOCs (social or participatory MOOCs), and ahMOOCs (Adaptive Hybrid MOOCs) [28] and instructors' role might differ according to different types of MOOCs. However, how instructors perform their functions to support students' learning in various types of MOOCs is considerably absent in the literature. Considering [29] acquisition and participation metaphor, we reiterate the two existing categories of MOOCs, cMOOCs, and xMOOCs, as the majority types of MOOCs are grounded in the acquisition metaphor since they emphasize delivering highly structured content for learning [8]. A suitable description of the learning process of these two types of MOOCs is provided by [Moya 2013, cited in 28]: cMOOCs emphasize a more participatory, active, collaborative, and interactive learning process while xMOOCs focus on a teacher-led, less participatory learning process. Thus, in cMOOCs, course instructors function more like facilitators by creating networks, connecting students to learning resources, and promoting collaboration and interaction [9, 13, 30]. Instructors in xMOOCs, on the other hand, take knowledge/content experts' roles by transmitting expert knowledge to students with minimal engagement in their learning [12, 13]. It is often the teaching assistants, rarely the instructors, who engage in facilitating students' learning by posting questions, replying to queries, and providing resources for learning [8].

In summary, the above-discussed studies point out that online instructors are expected to play multiple roles in online learning environments. The most recurring roles are pedagogical, managerial, social, and technical. Most of these studies emphasize the pedagogical role (course designing and content delivery) as crucial to facilitate students' online learning. They suggest that the social role (connecting students, building a learning community, sharing experiences, and providing feedback) is underexplored. These studies provide important insights into how instructors facilitate students' online learning. However, they do not adequately capture what instructors do in this process. There is a gap between general strategies to organize the learning process in online environments and what instructors do to facilitate students' online learning. This study addresses this gap

by examining instructors' roles in the ICTPED MOOC through the lens of cultural-historical theory.

3. Theoretical framework

From a cultural-historical perspective, the quality of teachers' guidance is crucial for the development of students' conceptual understanding [31]. Teaching-learning is a two-way, collaborative, and transformative process, originating in the external practices with tools[32] that mediate students' learning and enhance their development as learners [33, 34].

However, Vygotsky did not explain how the gradual transformation of students' external interactions with material or materialized tools to their internal plane happens [35-37]. Galperin, a contemporary of Vygotsky, expanded Vygotskyan ideas by explaining that the transfer of the original, external, socially meaningful activity to learners' internal plane happens through six dialectically evolving phases: (1) motivation, (2) orientation, (3) materialized action, (4) communicated thinking, (5) dialogical thinking, and (6) acting mentally [36]. In the initial motivational phase, a learner's attitude and relation to the learning outcomes that have to be achieved is formed. In the second orientation phase, Galperin identified three types of orientation: (i) incomplete, where mediational means and the essential features of the target concepts are identified by learners through multiple trials and errors; (ii) complete, where learners are informed about all mediational means that encapsulate the essential features of the target concept; (iii) complete, but constructed by learners following a general approach identifying the essential features of the target concept. In the third phase of a materialized action, learners interact with material or materialized objects, and over time become less dependent on the material support they give and more aware of the meanings they carry. Speech becomes the main guiding tool in the fourth phase of communicated thinking. The fifth phase, dialogical thinking, establishes a dialogue of a learner with him or herself so that the action is being transformed mentally. In the final phase of acting mentally, an action is performed by means of mental images and meanings that help a learner to deal with similar or differing situations on the basis of previous experience. These phases are used as an analytical resource to understand what the course instructors did at different times in the learning process in the ICTPED MOOC.

Students' increasing agentic engagement as independent learners is visible in their move from orientation to materialized action, communicated thinking, dialogical thinking, and acting mentally. While at the beginning of their learning, students are dependent on explicit orienting information and meanings encapsulated in the materialized objects they interact with, gradually, their agentic capacity becomes enhanced as they become less dependent on the support of the materialized objects and gradually move forward in their learning by making a transfer to the phases of communicated and dialogical thinking.

Such a transfer and transformations the students undergo during the learning process can be explained from the position of the transformative activist stance (TAS) perspective, which posits agency as collectively developed and expanded through participants' engagement to solve a common task [38, 39]. Agency is enacted in "transactional and collaborative dynamics of social practices in the process of individuals contributing to their realization" and transforming practices as well as actors involved in the practices [39]. Such a perspective is useful to examine how students' agentic engagement in learning during online meetings may affect the roles of the course instructors.

4. Methodology

4.1. Participants and setting
Data were collected during the online meetings, which were arranged on the Whereby video conferencing platform. The meetings aimed to help students to develop their understanding of the examination assignment they were to engage in. In the examination assignment, "Creating a Multimodal Text," the students were to submit: (i) an original monomodal text, (ii) a remediated multimodal text, and (iii) a reflection video. Table 1 presents a description of the examination assignment.

Students' participation in online meetings was voluntary, and in total, 30 meetings were offered and 17 different students participated in eight different meetings. Each meeting lasted for 45 minutes and was facilitated

Table 1

Examination assignment: creating a multimodal Text
The main goal of this assignment is to remediate a self-selected monomodal text into a new, multimodal text. The multimodal text should be used as a self-produced teaching resource that provides added pedagogical value in relation to the original text. Use an analogous printed or digital text (monomodal) as a starting point for the remediation. The remediated, multimodal text will be put into a pedagogical context, and you should be able to argue why and how the remediated multimodal text will enhance the development of students' conceptual understanding. You will need to submit the following three elements, which together constitute the examination assignment: 1. Original text (file/link) 2. Remediated, multimodal text (file/link) 3. Reflection video in which you reflect on the theoretical grounds to justify the chosen modes. You will also need to reflect on the pedagogical value of the remediated text by explaining how the remediated text may enhance the development of students' conceptual understanding. You may also write a declaration giving other participants the right to use your remediated texts in their teaching practice if they follow the copyright law in the correct manner.

by two-course instructors. One course instructor had been involved in the course designing and facilitating of students' learning for about six years and another was a novice who had joined the course in his first time facilitating students' learning online. The first author participated in the meetings as an observer, and he did not take part in the course instructor-student interactions. The online meetings were recorded in Studio as integrated into the Canvas Platform. Participants' consent was taken prior to the meetings. Table 2 provides an overview of the number of participants and instructors involved in the meetings, which were recorded for further analysis.

4.2. ICTPED MOOC

ICTPED MOOC (Pedagogical Information and Communication Technology Massive Open Online Course) is a credit-bearing course aiming to develop digital competence with pre- and in-service teachers. ICTPED MOOC is an xMOOC; it consists of seven modules and includes video lectures, information texts, automated quizzes, and assignment tasks. In the ICTPED MOOC, students have an opportunity to interact with the course instructors and their fellow students in discussion forums on Canvas and engage in online meetings. Table 3 presents the structure and the progress plan of the MOOC that students are to follow.

Module 3, "Multimodal texts," was selected for the data collection to examine how instructors facilitated students' learning during the online meetings.

4.3. Data and analysis

Video recordings of the supervision meetings were the primary data source. In the initial phase of data analysis, we went through all recordings (8 meetings, 360 minutes). Two recordings (90 minutes) that represented the patterns of facilitating as performed by an experienced instructor and a novice instructor (engaging for the first time in online instructional activities) were selected. The rationale behind selecting these two recordings was to examine whether the novice instructor considerably differed in his approach to facilitate students' learning from the experienced one.

The recordings of the online meetings were transcribed in Norwegian by using Jefferson's transcription notation (Appendix 1) [40]. Then the data were translated into English by the research team. Both authors examined the recordings separately and then discussed the patterns of facilitation together. The researcher triangulation was thus applied.

Eight extracts (four from each meeting) were selected for further analysis. The selected extracts representing the patterns of interaction between the students and the course instructors were analyzed by the method of interaction analysis [41—44]. The primary unit of analysis was sequences and turn-takings in sequences of interactions between the instructors and the students [45]. Each utterance was analyzed in relation to the previous one in the ongoing learning trajectories.

The interaction analysis was conducted in three steps [46]: first, the instructor-student interactions were described by referring to the numbered lines; second, interactions were analyzed from the perspective of the research questions; and third, the emergent findings were outlined. Finally, after the completion of interaction analysis, the extracts were examined following the analytical lens offered by Galperin's pedagogical phases

Table 2

Supervision meetings

Number of online meetings	Length of the meeting (in minutes)	Number of participants	Facilitators
1	45	1	Instructor 1
1	45	2	
1	45	3	
1	45	2	
1	45	2	Instructor 2
1	45	2	
1	45	3	
1	45	2	
8	360	17	2

Table 3

Structure and progress plan of ICTPED MOOC

Module	Progress plan (week)
0. Pre-course	2
1. ICT and learning	3—4
2. Digital studying techniques	5—6
3. Multimodal texts (examination module)	7—9
4. Cyberethics	10—11
5. Classroom management in digital learning environments	12—13
6. Assessment for learning	14—16
7. Flipped classroom (examination module)	17—21

to examine what course instructors did to facilitate students' learning at different times in the online meetings.

Additionally, students' reflection videos submitted as a part of their examination assignment were also analyzed. The aim was to examine how the ideas that students discussed in the online meeting were developed further into their examination assignment. Additional data were collected through the questionnaire administered to the students upon their completion of the course. The questionnaire consisted of 33 questions, and a question related to the online meeting was selected for the analysis (Q31: To what degree were you satisfied with the online meetings?). The question consisted of two parts: one part used a five-point Likert scale, and in the second part, the students were to provide their comments. By analyzing this question, we were interested in gaining further insights into students' experience of participating in the online meetings.

5. Findings

5.1. Analysis of quantitative data

We start our analysis by presenting participants' responses to Q31: To what degree were you satisfied with the online meetings (Table 4)? Initially, the questionnaire was administered to 365 students, and 25 students responded to Q31. However, 17 students participated in online meetings with instructors (see Table 2) and gave their consent to record the meetings. The students' responses to the first part of the question (that used a five-point Likert scale) are presented in Table 4.

The data show that the majority of the students were satisfied with the meetings, and a few students remained neutral about their opinions. For example, the students explicated their attitude to the online meetings by saying:

S1: It was useful to know if the examination assignment works as a pedagogical resource.

S4: It was excellent to discuss ideas, get confirmation and further guidance. It made me more confident when working on the examination assignment.

S6: Rather than answering the questions, the instructors could have given more advice about how to improve the examination assignment.

5.2. Analysis of qualitative data

5.2.1. Analysis of instructor-student interaction: Experienced instructor

Initiating the learning process

In the following extract, Table 5, the instructor and student are in their starting phase of the online meeting. From the Galperian perspective, the instructor and the student are in the orientation phase.

The instructor starts the meeting by explaining the requirements of the multimodal text the student will create (line 1). The student states that he has already started working on the task (line 2) and has chosen a book for remediation (lines 3 & 4). He explains the approach he

Table 4

Students' degree of satisfaction with online meetings

Responses	Frequency
Very satisfied	4
Satisfied	14
Neutral	6
Unsatisfied	1
Very unsatisfied	0
Total	25

Table 5

Initiating the learning process

1	Thomas (instructor)	Let me say something briefly before you start presenting your thoughts. The examination task you are going to solve should have a pedagogical value. You should explain this in the reflection video. I suggest you use a resource that is old or monomodal. For example, a book from the 1950s is often better than a book from the 2000s, as a lot of pictures are included in the textbooks created after the 2000s. However, you may use several books, not one.
2	Henrik (student)	Okay, yes. I have already started working on the assignment. I have chosen a book.
3.	Thomas	Yes. What is the name of the book? What is it about?
4	Henrik	The book is called "Breed Knowledge"; it is about dog breeds. This is the book that I used in my teaching before. It is no longer available. First, I have created a PowerPoint about the content of the book. Then, I have uploaded the PowerPoint further into Book Creator. Therefore, I think that I have come a long way. However, there are still some things that I wonder about. I have also created a series of educational films about dog breeds. I wonder if I should include links to these films in my multimodal text.
5	Thomas	Yes. Can you just show me the book?
6	Henrik	(Showing the book to the instructor). There is a lot of text, a good deal of pictures of different dog breeds. Text, text...
7	Thomas	Yes.
8	Henrik	It is roughly like that throughout the whole book.

has pursued to solve the assignment (line 4). The student is wondering if the videos he has created previously can be used in the examination assignment (line 4). The instructor is curious about the book the student has selected for remediation (line 5). The student presents the book to the instructor while commenting on its content (line 6). The instructor clarifies the examination assignment, and the student presents the draft he has created. He also explains how he intends to create a multimodal text. The instructor attempts to make sense of what the student has done. The instructor performs an orienting role by opening up the online meeting while reminding the student about the requirements of the examination assignment. In doing so, the instructor might have initiated students' reflections about what he has already done. However, by explaining his work-in-progress and presenting his ideas about how to further develop his multimodal text, the student might have affected the instructor's further advice about how to solve the examination assignment.

Reifying ideas
In the extract in Table 6, the instructor and student are engaged in making the student's ideas about how to solve the examination assignment explicit. From the Galperian perspective, the instructor and student are in the materialized action phase—they are engaged in discussing the student's draft.

The instructor explains how to select the content and present it in the multimodal text (lines 1, 3, & 5). He also points out the need to reflect upon the pedagogical value of the multimodal text in the reflection video (line 3). The student is wondering about the number of cases to be included in the assignment

(line 4). The instructor explains the required length of the text (line 5) and the student is willing to share what he has done (line 6).

The instructor explains how a good multimodal text can be created by exemplifying the characteristic features of the breeds. He points out that it is important to make each characteristic feature visible, preferably by using different modes. However, the student insists on the variety of breeds and different species within each breed. By offering the student to select two to three breeds, the instructor clarifies the requirements of the multimodal text.

By explicating how the characteristic features of different dog breeds can be presented by using different modes, the instructor may have initiated the student's reflections about how different modes may complement each other in a multimodal text. The student's comments about a variety of species within one breed may have evidenced his confusion concerning the amount of information that needs to be included in the multimodal text. Such a comment might have initiated the instructor's further clarification of the assignment requirements.

Developing conceptual understandings
In the following extract (Table 7), the instructor and the student are engaged in the discussion about how the student's draft can be developed further. From the Galperian perspective, they are in the communicated thinking phase.

The instructor encourages the student's ideas about how the multimodal text can be developed further (line 4). The student explains his approach to the content presentation (line 2). The instructor points out the

T a b l e 6

Reifying ideas

1.	Thomas	We do not expect you to include the whole book in your multimodal text... Let's say there are 20 dog breeds in that book. We are not necessarily interested in you presenting the same case twenty times.
2.	Henrik	I understand.
3.	Thomas	Insert several pictures of the dog. Take close-up pictures of the distinctive features of the dog. Make a movie showing the dog... animation [...]. You have to create a multimodal text. In the reflection video, you need to explain your choices and reflect on the pedagogical value of your multimodal text. For example, last year a student made a video about how football moves could be performed, and it was very good also.
4.	Henrik	Yes... but there are different species of a dog breed. For example, there are many types of a hunting dog.
5.	Thomas	I think two breeds can be enough. However, students may fail the examination because they take far too short text as a starting point.
6.	Henrik	Would you like to see what I have done so far?

T a b l e 7

Developing conceptual understandings

1.	Thomas	Tell me about your further thoughts.
2.	Henrik	There will be a presentation of different breeds of dogs one by one. I will present videos about dogs' breed and insert links to further information and activities.
3.	Thomas	But what I'm thinking here, after I heard your thoughts, you should visualize the characteristics of the dogs better than it is done in the original text. For instance, let's say that there was a vampire dog, which had vampire teeth. Then it is important to get a picture of its teeth. If it also had three stripes under the belly, then there should be a picture of three stripes, then you know that it was a vampire dog.
4.	Henrik	(Pointing the cursor to the dog on the shared screen) We have a bit of it on the one standing here, fast-running hunting dogs. For example, their eyes are much more out on the sides than other dog species.

need to present the characteristic features of the specific breeds (line 3). The student shows that he has already attempted to do so (line 4).

The instructor offers the student advice concerning how to explicitly present the characteristic features of the selected dogs' breeds. The student explains how he intends to make these characteristic features visible.

By asking the student to explicate his further actions, the instructor might have encouraged the student's reflections about his further steps. However, the student's ideas initiated the instructor's explanations about how a multimodal text might enhance students' conceptual understanding of the target dogs' breeds. In doing so, the ideas explicated by the student might have initiated the guidance offered by the instructor.

Summarizing

In the following extract, Table 8, the online meeting is coming to an end, and from the Galperian perspective, the student and the instructor are in the phase of dialogical thinking.

The instructor encourages the student's further reflections about the assignment (line 1). He provides advice on how to create a reflection video and draws the student's attention to the assessment criteria (line 3). The instructor offers further support to the student (line 5). The student reflects on his understandings (lines 1 & 3) and explicates his ideas about how to organize and present various modes in the text (lines 2 & 4).

The instructor initiates the student's further queries. The student outlines his further actions by summarizing the ideas they discussed at the meeting. As an extension of the student's thoughts, the instructor offers technical advice about how videos may be created and reflects on the need for a universal design when creating a multimodal text. In addition, he reiterates the assessment criteria for the reflection video. The student explicates his understanding by detailing how the advice offered by the instructor will be taken in his work. Finally, the instructor reminds the student about the other available lines of support.

In the reflection video submitted as a part of the examination assignment, the student mentioned:

> I revised the tutorials that I had prepared for students with dyslexia last year [...] I have selected some dog breeds and highlighted their characteristic features in bullet points. I have also prepared audio and video files of the presented breeds. I have also embedded links for quizzes [...] I have embedded the link to the Swedish dog kennel club that describes many breeds of goods for further information and deeper understanding. I used the Book Creator for remediating my text (...) I have uploaded it in It's learning for my pupils.

This extract indicates that the student has implemented ideas discussed in the online meeting in his multimodal text. Such reflections might evidence his understanding of the examination assignment.

5.2.2 Analysis of instructor-student interaction: Novice instructor

Initiating the learning process

Two students and an instructor are participating in the online meeting. One student takes the initiative to open up the meeting. From the Galperian perspective, the instructor and the students are in the orientation phase.

Ellen takes the initiative to open up the online meeting (line 1) and makes a four-minute-long presentation about her task-in-progress in detail. She explains and justifies how she has planned to present the content of a book chapter she has selected. The instructor encourages the student to present her ideas (line 2). He, along with another student, listens to her.

By encouraging the student to share her examination task-in-progress, the instructor initiates the student's reflections about the examination assignment. The student's detailed reflections set up the scene for the meeting to shape the instructor's further guidance.

Reifying ideas

Table 10 shows that the students and instructor are engaged in a discussion to make the student's ideas about

Table 8

Summarizing

1.	Thomas	We have a few minutes left, so if you have any questions, go ahead.
2.	Henrik	I think I will work on videos and pictures of dogs' breeds and try to make [them] more explicit. And then I wonder if I should put an audio file on each breed where I explain the characteristic features of each breed in bullet points.
3.	Thomas	Remember the standard icons for sound. An important advice for the reflection film: do not record it in one click. Besides, make sure that you reflect on all assessment criteria. Remember that the multimodal text task you create should have a pedagogical value.
4.	Henrik	Yes. I will do so. Recoding at one go can be difficult for me... I am thinking about short sequences in the reflection video (...) Now, I think I have picked up the key ideas for this assignment. Some students will be able to listen to the audio file I have made, and others will be able to read the text.
5.	Thomas	I wish you good luck with the examination assignment. Ask questions in the discussion forum if there is anything else you are wondering about. Alternatively, we offer tutoring sessions. You can participate in these sessions if you have further questions about the examination assignment, but note that the instructors are available only 20 hours in a week. You can also contact the student service center and they can also provide you some assistance.
6.	Henrik	Yes, this sounds good.

solving the examination assignment explicit. From the Galperian perspective, they are in the phase of materialized action.

The instructor prompts the student to choose various resources (line 1). The student explicates her ideas about the topic of marketing (line 2). The instructor indicates the availability of various resources for creating a multimodal text with pedagogical value (line 3). He emphasizes the learning design of the multimodal text and elaborates what a learning design entails (lines 1, 3, & 5). He draws the student's attention to the need to enhance student-centered learning (line 5). The student gets an insight into the design of the examination assignment (line 6).

The instructor draws the students' attention to the need to use various resources. The student elaborates on the details of the topic marketing, and the instructor reveals how the design of a multimodal text can enhance student-centered learning.

By explicating the details of the topic "marketing," the student might have shaped the instructor's further guidance to reveal the various aspects of a learning design. In doing so, he might have helped the students to understand the complexity of creating multimodal texts to enhance student-centered learning.

Developing conceptual understandings
In the following extract, Table 11, two students and the instructor are engaged in developing their understanding of the examination assignment. From the Galperian perspective, they are in the phase of communicated thinking.

The student explicates her understanding of how to organize her multimodal texts to address the needs of different pupils (lines 1 & 3). However, she expresses her concerns about the amount of information in the videos and written texts (line 1). The instructor acknowledges her challenges; however, he suggests making a video

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Initiating the learning process

1.	Ellen (student)	Who would you like to start first, Geir?
2.	Geir (instructor)	You can just start, Ellen.
3.	Ellen	Okay. Well, I am going to remediate a chapter from a marketing and leadership textbook used in the upper secondary school. The text is about pricing strategies. It explains how the company should set reasonable and correct prices for its goods. I chose this text because I think it is difficult for the students. Both textbook authors have given their consent to publish the multimodal text based on their book. The content I have selected also meets the curricular goals. I am going to use the Book Creator to create an e-book. I would like to change the original order of the content because I think it is presented in a fragmented way. Then I will prepare an audio file of the whole text. I have also prepared some tutorials explaining how to do price calculations, followed by the problems that students will engage with. I use Explain Everything to show how multimodal texts I have selected for the examination assignment are interrelated. I will add quizzes that will help students to check their understanding of the concepts. However, here, I am a little uncertain whether one can do the quiz as it opens in a separate tab, so students have to go back to the main task when they finish it. Then I thought I should also make a multiple-choice test for students to check their understanding. I will also end the entire task with a case study... So, I use both text, audio recordings, tutorial videos, practical exercises, links, explanatory videos, quizzes, and other types of activities. That is what I have been thinking.
4.	Geir	[...] Okay, we discuss it now in the meeting [...]

T a b l e 1 0

Reifying ideas

1	Geir	Well, I think you should go beyond the linear design of multimodal texts. Imagine that you have a learning design with various quizzes, multiple-choice questions, etc. It seems like you have had a lot [...] You said that you were working on the topic "marketing," right?
2	Ellen	Yes. [...] Pricing strategies is the topic now [...] Moreover, there is psychological pricing; for example, we put 299 and not 300. It is one of the ways of competing with pricing. After all, it does not influence digital marketing as a theme.
3	Geir	Okay. But if you are going to develop an examination assignment that has a pedagogical value, there are many ways to do it. For example, YouTube videos and other courses address how to work with marketing in such a social media context. I think you should select various resources, but you just talk about the practical use of marketing.
4	Ellen	[...] Okay.
5	Geir	You should build up a learning design. You should somehow break the design down into something like 1, 2, 3, 4 modules. You can call it a learning path. In other words, it is about specifying when the teacher should have an active and a passive role in the students' learning activities. Then you have learning activities for students to work on. Another element that you may consider is to what extent your learning design itself promotes sharing, collaborative, and individual learning. How does your multimodal text facilitate your students' learning? Thus, these things should be clear in your design.
6	Ellen	I have not really thought about this dimension of the assignment. I have to write it down.

rather than presenting a text (lines 2, 4, & 6). Both the instructor and the student acknowledge the usefulness of developing understanding of marketing concepts by watching tutorials rather than reading textual information (lines 5 & 6).

The student explicates her concerns about presenting information in videos and texts in a balanced manner. Admitting the challenges, the instructor suggests creating a video. The student agrees with the instructor.

By raising questions about how to present multiple modes in a balanced manner, the student initiates the instructor's guidance to address the challenges indicated by the students. The instructor suggests creating videos and the student explicates her agreement.

Summarizing

In the following extracts (Table 12), the online meeting is coming to an end, and from the Galperian perspec-

tive, the instructor and the students are in the phase of dialogical thinking.

Following the instructor's indication about the end of the meeting (line 1), the students summarize their ideas about solving the design of the examination assignment. Both students decide to create an e-book combining multiple modes to cater for varied students' needs (lines 2, 3, 5, & 7). The instructor is curious about the usefulness of his guidance (line 4) and emphasizes the need to consider a learning context (line 6).

The students explicate their further steps to solve the examination assignment. However, they remain somewhat uncertain about balancing content in multiple modes.

The students summarize their understanding of their approaches to solve the examination assignment. They express their concerns about balancing content in multiple modes to cater for students' individual needs. Their concerns might have called for further clarifications

Table 11

Developing conceptual understandings

1.	Ellen	I am thinking of making an audio file of all texts because students with visual impairments will take advantage of it. However, I think it is a bit difficult to make videos. For example, if I am going to write everything I say in the videos, then I have both text and videos, but is it necessary? Should I write in the text about what comes in every video? I think I should either say the key things in the videos or write in the text. A video of just a few minutes will correspond to many pages as a text. What do you think?
2.	Geir	I think it is a difficult question to consider. I do not know exactly what to say about that.
3.	Ellen	Okay. When I record something in the videos, I say a lot more than I write. If someone prefers reading the text, then she/he will get less information than those who prefer watching videos.
4.	Geir	[...] I think an audio-visual explanation is better [...] You should focus on making a video, and you do not necessarily need a text. So avoid offering redundant information.
5.	Ellen	Yes, I have not seen anyone who managed to learn these calculations by reading the textbook. Therefore, I have decided to make a tutorial rather than an e-book. In the talking head videos, I show them calculations in Excel and explain different elements.
6.	Geir	When you explain things in that way, then I think it enhances the pedagogical value of your examination assignment. Making mathematics tutorials is not unusual in an online course. Such videos are more effective for learning than reading a textbook.
7.	Ellen	Yes.

Table 12

Summarizing

1.	Geir	I think our time is over.
2.	Ellen	Yes. Thank you for your feedback [...] I have also thought a bit about the examination assignment that I have created. The pupils will also be able to complete it alone at home. If, for example, they are away for a week due to the flu, they should be able to solve the task on their own and learn the target concepts.
3.	Maya (Student 2)	Yes. I have had similar thoughts.
4.	Geir	Was my advice helpful?
5.	Ellen	Yes [...] I am just a little unsure (...) Whether I should create an e-book that pupils should follow. As Maya said, I am concerned about an individual approach. For example, I have some pupils with dyslexia in my class, and they need much time for reading. These students will benefit from watching videos, but they might be unwilling to collaborate on classroom tasks.
6.	Geir	Think about different learning contexts as well. The task you create for the classroom might not be useful for the online context.
7.	Maya	Yes, at least we have some ideas. I feel that I end up creating a type of e-learning book. However, I disagree concerning what has the greatest pedagogical value. Therefore, I will focus on collaborative tasks. We will collaborate to work on the ideas we have discussed.

from the instructor, but he neither clarifies nor informs the students about the possible resources for further guidance. This might have led the students to seek out their own resources (peer collaboration) to discuss the examination assignment further.

In the reflection video submitted as a part of the examination assignment, Ellen mentioned:

> [...] Setting psychological pricing strategies is the topic of the multimodal text [...] I have created audio-visual and textual resources accompanied by different tasks. I have used many text types. I have also used the Explain Everything tool for summarizing key concepts in the multimodal text. I have added some exercises for students to reflect their understanding [...] At the end of the text, I have assigned a case study work for pupils because it is a normal practice in [the] marketing and leadership subject [...] Students can solve the case study as an online exercise. I have attempted to be creative when designing my multimodal text [...]

This extract indicates that the student has implemented the ideas discussed in the online meeting in her multimodal text. Such reflections might evidence that the guidance of the course instructor offered in the online meetings might have contributed to the development of the student's understanding of the examination assignment.

6. Discussion

By taking a cultural-historical perspective, this study examined how the course instructors facilitated students' learning during online meetings in the ICTPED MOOC. Additionally, it also attempted to provide an insight into how students' engagement in the meetings affected the instructors' guidance. The quantitative data showed that the students were satisfied with the online meetings. The findings of the qualitative analyses are discussed in relation to previous research. The patterns of instructors' guidance are presented in Table 13.

The analyses of instructor-student interactions with both the experienced and the novice instructors revealed the patterns of facilitating students' learning in the online meetings. These patterns make visible that the instructors (i) set up the learning process, (ii) discussed the students' drafts in detail, (iii) assisted the students to develop their understanding about their further steps to solve the examination assignment, and (iv) structured the students' understanding by clarifying the target concepts and offering further support. These findings corroborate with the studies that have examined teachers facilitating students' learning in technology-rich classroom contexts [35, 47]. The findings in the previous research indicated that instructors offered more guidance to the students in the orientation phase and in the phases of communicated thinking than in the phase of dialogical thinking. In this study, the course instructors, especially the experienced instructor, offered limited information about how to engage in the examination assignment task in the orientation phase. In the case of the novice instructor, the students themselves set up the learning process by sharing their examination assignment drafts. The instructors offered more elaborate guidance in the phases of materialized thinking and communicated thinking than in other phases. They probed into students' ideas and explained in detail how multimodal texts can be combined to enhance the pedagogical value of the examination assignment. The instructors' orienting function was partly similar to the managerial role discussed in the literature, which includes creating conditions for learning by setting an agenda, approaches to carrying out the agenda, and directing learners' activities [1, 24].

While performing the executive role, the instructors assisted the students in developing their conceptual understanding of the examination assignment. They vetted and reified the ideas embodied in students' drafts in the phase of materialized action. Students' assignment drafts

Table 13

Patterns of instructors' facilitative activities

Phases of guidance	Instructors' functions	Galperin's pedagogical phases and instructors' roles	
Initiating the learning process	Setting up the meetings by explaining the examination assignment Encouraging students to present drafts Making sense of the students' drafts	Orientation Materialized action	Orienting
Reifying ideas	Discussing students' drafts Reifying students' ideas and concepts		Executive
Developing conceptual understanding	Encouraging students to express their ideas about the further development of their multimodal texts Providing feedback on the students' ideas	Communicated thinking	
Summarizing	Encouraging students to reflect upon their final understanding of the examination assignment Structuring students' understanding	Dialogical thinking	Controlling

as the objects of discussion functioned as the meditational resources for visualizing the target concepts. The experienced instructor used examples from students' drafts shared on the screen and referred to the sample examination assignments to help the students understand how multiple texts could be combined using various technological tools to create a multimodal text. By doing so, the instructors might have helped the students to understand various dimensions of the assignment. In the phase of communicated thinking, the instructors encouraged the students to express their ideas about the further development of the multimodal texts and provided feedback on them. The experienced instructor explicitly asked the students for their reflections, while the students interacting with the novice instructor took the initiative to reflect upon their understanding. However, both instructors encouraged the students to explicate their further thoughts and develop their understanding of the examination assignment. The analyses of students' reflection videos indicated that the students implemented the concepts discussed in the meetings in their examination assignments. The instructors thus helped the students to cultivate their thinking and reasoning about the examination assignments and develop their conceptual understanding. The instructors' executive functions can be compared with the pedagogical role [1, 21, 24] and facilitative role [26] as instructors stimulated interactions and reflection, provided feedback, and asked probing questions.

While performing a controlling role in the phase of dialogical thinking, the instructors encouraged the students to explicate their understanding. They summarized and structured the target concepts and offered advice for further guidance. Synthesizing students' comments, clarifying dilemmas, and offering further assistance is a part of the instructors' pedagogical role [1, 21, 24]. The experienced instructor explicitly checked students' understanding by encouraging them to reflect upon what they had understood and thought of further steps to improve the assignment drafts, while the novice instructor was more interested in the students' feedback concerning the usefulness of his guidance. This suggests that novice instructors might feel a little uncertain about the impact of their guidance.

More interestingly, unlike in the classroom context where instructors performed their explicitly designed preplanned activities [e.g., 47], none of the instructors had pre-prepared content in the meetings. Their facilitating activities were contingent upon what and how students presented their drafts and ideas about how to solve the examination assignment. The instructors primarily focused on making sense of students' thoughts related to their drafts and adjusted their guidance to their needs. In doing so, the instructors became the co-participants and co-contributors to the learning process as the students chose what to discuss, enacting their agency.

The orienting, executive, and controlling guidance offered by the instructors evolved as they engaged in the interactions with the students. The instructors' guidance and students' learning in these interactions were cyclic and mutually inclusive, forming a coherent learning ecology where both instructors and students engaged in making sense of how to design the examination assignment.

The online meetings were student-initiated as they first explicated their needs in the meetings by sharing their assignment drafts, which were the objects of interactions between the instructors and students in the meetings. The students extensively engaged in and contributed to the learning process from the beginning to the end of the meetings. The instructors engaged in making sense of students' ideas embodied in their drafts, vetting and reifying them to help students develop and enhance their conceptual understanding of the examination assignment. Their guidance functions were subject to change according to students' articulations of their needs. Students' active engagement in the learning process immersed the instructors in students' learning, as they explicated and validated students' ideas and directed the learning process. The students' agentic engagement and their contributions to the learning process positioned the instructors as co-contributors to develop and expand their conceptual understanding of various aspects of the examination assignment. Students' meaningful immersion in the learning process also demanded the instructors' guidance, which brought the instructors' agency into play by engaging them in understanding students' ideas, structuring them, and guiding them forward while addressing their needs [48]. This might suggest that students' agentic engagement might affect the guidance the instructors provide in online meetings, and by immersing in meaningful learning activities, both students and instructors can enhance their agency as active participants of and contributors to the learning process [39, 47].

To summarize, the instructors performed three mutually inclusive and evolving roles: orienting, executive, and controlling to assist the development of students' conceptual understanding during online meetings. The students' active engagement and contribution to the meetings made the instructors actively participate and contribute to students' learning. Thus, the instructors' guidance was contingent upon students' articulations of their needs in their pursuit to design the examination assignment.

7. Implications and directions for further research

There are several pedagogical implications for designing and facilitating social, collaborative learning activities in MOOCs and online courses. First, the course instructors performed three mutually evolving roles: orienting, executive, and controlling. While performing these roles, they set up the background for the online meetings, engaged in reifying and explicating the students' ideas, and assisted the students in developing their conceptual understanding of the examination assignment. However, these roles evolved out of collaborative practices aimed at designing the examination assignment. This indicates the need to integrate goal-oriented collaborative learning activities in MOOC and online

learning environments to assist students in developing their understanding of the target concepts.

Second, the differences in the guidance offered by an experienced and a novice instructor demonstrate different approaches to develop students' conceptual understanding. In particular, the guidance offered by the experienced instructor suggests the need to assist students in developing their understanding of the examination assignment by validating their actions and ideas against the text of the assignment and the assessment criteria.

Third, probably a more profound implication is that students' agentic engagement might affect the course instructors' guidance in online learning environments. The findings indicate that students were active in setting up and driving the learning process by expressing their ideas, justifying their approaches, to solve the assignment task, and articulating their needs for guidance. Such student engagement positioned the instructors as sense-makers and providers of feedback to students' ideas. In their words, the instructors' guidance was contingent upon students' contributions to the learning process. Students immersing themselves meaningfully in a collaborative learning process may activate their agency, calling for instructor agency in responding to as well as (re-) directing students' pursuit to solve the task. Such student engagement in the online meetings positions them as central drivers of their learning, which might contribute to enhancing their agentic capacity to learn. The instructors' guidance adjusted to students' needs might contribute to further enhancing their agentic development as professionals.

Finally, the instructors' guidance shaped by the students' agentic learning in online meetings might offer useful considerations about how to realize, expand, and enact agency. These considerations suggest that collaborative practices are of paramount importance for students' learning and development and indicate the need to offer synchronous, collaborative social learning activities in the predominantly asynchronous MOOCs format. Instructors have a vital role to play in supporting students' collaborative social learning activities. Numerous technologies are available to enable synchronous collaborative learning; however, the instructors have a vital role in including these technologies to help students develop their conceptual understanding and agentic capacity to learn.

These findings inform the practitioners, MOOC, and online course developers about how instructors facilitate students' learning online and how students' agentic online learning may influence their guidance. The instructors' and students' engagement in online meetings might therefore contribute to the development of students and instructors as learners and professionals. Further research would therefore benefit from a longitudinal study examining how students' engagement in online learning might enhance their agentic capacity to learn.

Appendix 1

Transcription notations

Symbol	Description
[ ]	Speech overlapping.
( )	Unclear section
Underlining	Denotes a raise in volume or emphasis.
CAPITALS	Louder or shouted words
[...]	Utterances removed from original dialog
...	Incomplete sentences

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Исследование функций преподавателей в процессе обучения студентов в онлайн-курсе о педагогическом использовании информационных и коммуникативных технологий

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В статье исследуются функции преподавателей в процессе обучения в онлайн-курсе с целью формирования навыков преподавания с применением цифровых технологий студентами педагогических вузов и учителями норвежских школ. В статье также рассматривается, как участие студентов в процессе обучения влияет на функции преподавателей в данном процессе. Онлайн-встречи студентов с преподавателями наблюдались и записывались. Встречи были направлены на развитие понимания студентами экзаменационного задания. Данные (4,5 часа видеозаписи) были проанализированы с использованием метода коммуникативного анализа. Результаты анализа показали, что преподаватели выполняли четыре основные функции: 1) начинали учебный процесс; 2) выясняли идеи студентов по выполнению экзаменационного задания; 3) помогали студентам в формировании их концептуального понимания; 4) обобщали и структурировали понимание студентами основных концепций. Данные функции педагогов возникли в ходе совместного обучающего процесса преподавателей и студентов. Активное участие студентов в процессе обучения было особенно заметно, когда они проявляли инициативу и открыто делились своими идеями по выполнению экзаменационного задания. Преподаватели, в свою очередь, играли важную роль в обсуждении идей и вопросов студентов, возникающих в совместном процессе обучения. Таким образом, активное участие студентов оказало влияние на педагогические функции преподавателей онлайн-курса. При таком подходе диалектическое взаимодейсвие между студентами и преподавателями является важным и одним из основных аспектов обучения в онлайн-среде.

Ключевые слова: функции преподавателя, активное участие студентов, онлайн-преподавание, обучение, взаимодействие, агентность, П.Я. Гальперин.

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