CHAPTER 6

Engendering Transformative Learning in an Institutional xMOOC

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Introduction

The rise of online learning has caused higher education institutions (HEIs) to think differently about how they can provide and expand online learning opportunities for students. Massive open online courses (MOOCs) have become a popular alternative for HEIs when it comes to flipping their existing pedagogical practices in online learning environments. The debate around the transformative potential of MOOCs has not faded. Research has suggested that MOOCs can become agents of change and innovation in HEIs because they foster self-directed, flexible and ownership-taking learning (Ossiannilsson et al., 2016). They

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can promote meta-literacy (e.g., critical thinking, reflection about one's goals, roles and action) because learners get opportunities to engage with learning resources both independently and collectively (Mackey & Jacobson, 2022). Learners can develop 'action confidence' (the willingness and courage to act to learn because of the changes in one's previously held thinking) throughout their participation in the MOOC learning process, which is reflective of transformative learning (epistemological change in learners) (Pomeroy & Oliver, 2020). This action confidence is developed when students engage in course resources to make sense of and expand their conceptual understanding of learning content and problems. Thus, we argue that engagement with resources (both human and nonhuman) is required to develop, expand and advance a conceptual understanding of learning contents and problems, leading to a gain in transformative learning experiences.

Several studies have indicated the transformative potential of MOOC resources for student learning. For example, Beer (2019) observed that students demonstrated transformative learning because the activities of listening and watching audio–video resources and posting questions and comments on discussion forums promoted reflection and discussion of students' understanding. However, such activities remained at the lower levels of Mezirow's (2003) seven stages of critical reflection (disorienting dilemma and self-examination). In the Norwegian context, research studies drawing on cultural-historical theory (CHT) have indicated that resources in institutional MOOCs offer opportunities for student teachers to enact and develop their transformative agency (ability to take action to develop knowledge and solve problems) because they reflect on their prior knowledge, pitfalls in their understanding, devise strategies and take actions to solve their problems, enhancing their professional digital competence (Brevik et al., 2019). Student teachers also develop their digital identity and agency in learning by engaging with resources because they learn how to use and engage in those resources to develop a conceptual understanding of learning tasks (Engeness, 2020; Engeness & Nohr, 2020; Engeness et al., 2020).

According to Robson (2018), digital identity is a dynamic and ongoing process of sense-making and reinterpreting one's beliefs, values and educational experiences that develops through one's engagement in work activities in a new learning context. Students can develop their digital agency by understanding how to engage in the dynamic process of sense-making and interacting with the digital learning environment (Engeness,

2020). Thus, it can be argued that digital identity and agency evolve by engaging with learning resources in a digital learning environment and fostering transformative learning experiences.

Therefore, it is crucial to examine how students perceive and experience learning resources in MOOCs as a failure to engage students, along with how this then results in massive student attrition rates (Borrella et al., 2022). Understanding how students prefer learning can contribute to designing and offering good learning resources for promoting student engagement in an online learning environment where students remain remotely located, often unknown to fellow learners and instructors. The current study examines students' perceptions and experiences of engaging in learning resources of an institutional xMOOC and discusses to what extent those perceptions and experiences contribute to fostering transformative learning experiences by analysing postcourse surveys of the MOOC. The following research questions were addressed:

1. *How did students perceive and experience their engagement with various course resources (e.g., video tutorials, assessment tasks, guidance and feedback) in the institutional xMOOC?*
2. *To what extent did students' engagement with course resources contribute to transformative learning?*

The chapter is organised as follows: First, we establish a research perspective and outline a theoretical perspective and current research on the learning potential of MOOCs in Norway. Second, we account for the research methodology used in the present study. Third, a data analysis section follows, which describes the learning design of an institutional xMOOC before quantitative and qualitative data are analysed to show its effectiveness. Fourth, the findings are critically assessed in the discussion section. Finally, suggestions are recommended to promote students' engagement in institutional MOOCs, leading to the promotion of transformative learning experiences.

Defining a Research Perspective

To address how our study might contribute to new knowledge or reaffirm research knowledge, a research perspective must be defined. Over the past few years, we have observed that researchers have discussed

and analysed to what extent MOOCs can foster learning. It addresses how students engage with learning resources and research knowledge, resulting in different approaches and research streams.

A series of studies has resulted in the emergence of research streams exploring *student engagement in MOOCs*. Students' engagement in MOOCs focuses mainly on the observable aspects of students' activities in the courses. For example, based on students' activities in the discussion forums of FutureLearn MOOCs, Ferguson and Clow (2015) found four patterns of engagement: sampling (exploring the content of interests), auditing (watching most of video tutorials but not completing all assessments), disengaging (completing assessment in the beginning but slowly dropping out of the course), and completing (completing most of the assessments). Other studies also considered the amount of time students devote to learning course materials (Lu et al., 2017), such as watching videos, answering quizzes, submitting assignments and posting and answering in discussion forums (Kuo et al., 2021; Sun et al., 2019).

According to Kala and Chaubey (2022), students' engagement with the essential resources of MOOCs, such as synchronous sessions, prerecorded lectures, self-directed learning, discussion forums, peer assessment and breakout groups, can influence their learning. However, they found social engagement (engaging in interactions with peers and instructors) to be more significant for students' learning. Social engagement is not a subtype of behaviour engagement (e.g., watching videos, posting questions, completing assignments, etc.) but an essential dimension of MOOCs when it comes to capturing student interactions with instructors and peers (Deng et al., 2020). Therefore, to ensure active student engagement, MOOC instructors should create enticing presentation materials, lecture videos, assignments and online course environments in which students can enjoy the course content, which can move students from mere sharing and comparing information to greater exploration of facts and trends (Meet & Kala, 2021).

Research studies have documented that social, interactive and collaborative learning activities contribute to fostering students' learning, but these activities remain low in MOOCs (Daniels et al., 2016; Gamage et al., 2020). A systematic review of engagement and desertion in MOOCs by Estrada-Molina and Fuentes-Cancell (2022) indicated that fostering individualised tutoring, interactivity and feedback are the main challenges in promoting students' engagement in MOOCs. Alemayehu

and Chen (2021) reviewed a body of literature (2014–2020) on the challenges of engagement for instructors and students in MOOCs; they found that most studies emphasised fostering learners' engagement and interaction in MOOCs because these are fundamental to motivating students to complete MOOCs. The literature has shown that learner engagement is an essential issue in minimising dropout rates in MOOC learning environments. However, quantitative analysis is the most commonly adopted research approach for studying learners' engagement in MOOC learning; Alemayehu and Chen (2021) suggested using a qualitative design to understand learners' engagement challenges so that their feelings can be heard and observed.

However, engagement is a multidimensional construct, including four interrelated components: behavioural, cognitive, emotional (affective) and social (Deng et al., 2020; Ogunyemi et al., 2022). Behavioural engagement refers to observable behaviour, such as watching videos, doing quizzes, posting on discussion forums and completing assignments. Most MOOC studies focus on students' behavioural engagement (Deng et al., 2020), which is the fundamental driving force behind students' learning achievement and persistence (Gengxin & Sheng, 2018). Emotional engagement refers to a sense of belonging, enthusiasm, liking and attachment, but it is limited to students' MOOC discussion forum activities (Deng et al., 2020). Cognitive engagement in MOOCs has been explored by examining students' abilities to engage in self-regulated learning activities. Cognitively engaged students can efficiently self-regulate their learning because they can post and answer questions in discussion forums, but there exists an interrelation between social interaction and cognitive engagement in MOOCs (Galikyan et al., 2021). Here, social engagement refers to participants' willingness to connect, socialise and interact with course participants in MOOCs (Daniels et al., 2016). Discussion forums remain the main spaces and tools for the above-mentioned types of engagement (Ogunyemi et al., 2022). Students' poor engagement with learning resources remains the primary cause of students' dropout rates in MOOCs (Setia et al., 2022).

Another stream of the literature has focused on how video lectures can promote students' engagement in learning. Engeness et al. (2020) examined how *videos* might support pre- and in-service teachers' learning in an institutional xMOOC (2014–2018) aiming to develop digital skills and enhance students' agency in the Norwegian context. Their study found three patterns of participant interactions with videos: '(a) seeking

explicit information about how to engage in learning, (b) seeking assistance while engaged with the assigned tasks, (c) support to compare learning outcomes with the requirements outlined in the videos' (p. 1). Video tutorials might provide three types of orientation support, as conceptualised by Galperin (2023): orienting (knowing how to engage in learning), executive (performing an action) and controlling (reflecting upon understanding) to help students structure their learning processes by using appropriate mediational tools. Most participants used videos for executive support and preferred videos of 5–10 minutes in length. As the findings suggest, videos can enhance participants' capacity to learn in digital settings and might promote learners' transformative digital agency (Engeness et al., 2020). Another study examining how preservice and in-service teachers engaged in an institutional xMOOC suggests that most participants were involved in learning information given in written text, while other participants engaged in learning by watching video tutorials and audio texts (Engeness & Nohr, 2020). Small private online courses can invoke student teachers' transformative agency because the resources in the course allow students to reflect on their understanding, recognise challenges, develop actions to deal with challenges and commit to solving their problems (Brevik et al., 2019).

In contrast, we can observe a research stream that attempts to establish student engagement and the use of learning resources by employing *learning theories*. In CHT, teaching and learning can be seen as a mutual, social and collaborative process of developing and advancing a conceptual understanding or meaning-making (Vygotsky, 2012). Teachers should create a learning environment by arranging resources that can scaffold students' learning, leading to a promotion of their proximal development zone (maximum learning potential) through engagement, interaction and collaboration (Vygotsky, 2012). According to Vygotsky, for the curriculum to be developmentally appropriate, the teacher must plan activities that encompass what students are capable of doing on their own and what they can learn with the help of others (Karpov & Haywood, 1998). The content of xMOOCs can be taken from systematically organised academic concepts that provide an intellectual reference for learners to interpret and reconstruct their everyday event-related experiences, which Vygotsky (2012) referred to as spontaneous concepts. However, it might be challenging—or almost impossible—for instructors to assess what an individual student can do with or without instructional support in a MOOC learning environment because of the exceptionally high

teacher–student ratio, along with the fact that some students never engage in interaction (Chua et al., 2017). Students might fail to develop scientific concepts because of the lack of their engagement in an interactive learning environment, so learning can result in the superficial recapitalisation of adult minds in MOOCs. Learning to develop a deep understanding or systematic understanding of learning tasks demands students' engagement with learning resources because students assess their understanding, figure out pitfalls in their understanding and take actions to develop a thorough understanding with the support of learning resources (Singh, 2022).

Like Vygotsky, Dewey (1933) also emphasised providing learning resources as scientific reference materials to guide students' learning. Dewey's statement is that adults' mature experiences are valuable materials to help learners interpret their experiences and provide guidance and direction, but these materials should be questioned and their usage justified (Dewey, 2018). The adult mind, in the words of Dewey (2018), refers to an organised body of scientific knowledge that creates a learning environment for interaction by which teachers know students' level and way of understanding from where they begin the educative process. These ideas echo Vygotsky's notion of the zone of proximal development, which emphasises creating an interactive learning environment where teachers can assess what students can do independently and what they can do with adult assistance (Vygotsky, 2012). These scholars emphasise that learning resources should help instructors and students assess their current level of understanding and assist them in guiding further directions and possibilities. Vygotsky emphasised that higher psychological functions, such as voluntary attention, reasoning, critical thinking, and higher-order thinking, develop through engagement with resources in an interactive, social environment (Veresov, 2021). As an organised body of scientific knowledge, xMOOCs might create a learning environment offering diverse resources for students' engagement, leading to fostering students' questioning, reflective thinking, communicative and collaborative activities.

Research studies drawing on Vygotsky's CHT have suggested that student teachers in institutional xMOOCs develop their professional digital competence by enacting their transformative agency (taking action in developing understanding and solving learning problems while engaging in challenging learning tasks) (Brevik et al., 2019). In other studies that draw on Galperin's (1989) pedagogical theory, the expansion and development of the pedagogical domain of Vygotsky's CHT

(Engeness, 2021) suggest that teachers and students can develop their digital identity and agency in learning by positioning themselves as active agents in knowledge practices in institutional xMOOCs (Engeness, 2020; Engeness & Nohr, 2020; Engeness et al., 2020). Digital identity and digital agency develop or are developed when students and teachers are in online learning and designing learning environments. (Engeness et al., 2020). When students engage in learning resources, for example, videos (Engeness et al., 2020) or textual information (Engeness & Nohr, 2020), they learn their usefulness in developing their understanding and solving their problems. They also learn how to use and engage these resources for learning, enacting and developing agency—the capacity to meaningfully engage in learning (Engeness, 2021). By engaging in online collaborative learning sessions in institutional MOOCs, students can enact and develop their coagency in learning (Singh, 2022). Therefore, we argue that engagement with learning resources is fundamental in gaining transformative learning experiences. Students learn to make sense of learning tasks, reflect on their prior understanding and take action to develop and deepen their knowledge through engagement and social discourses. Transformative learning is a process of meaningfully engaging with learning resources individually and collectively, here aiming to develop and advance a conceptual understanding of learning problems (Engeness, 2021; Stetsenko, 2017).

Engagement has two interwoven functions: one promotes interaction with resources, and interaction enhances internalisation (growing mentally or enhancing the capability to solve problems) (Engeness, 2021; Vygotsky, 2012). According to Galperin (1989), to transform external social action into internal mental action, learners should go through some dialectically evolving pedagogical activities such as orientation (knowing how to engage in activity), materialised action (using concrete materials to develop understanding), communicated thinking (debating), dialogical thinking (reflection on the target understanding), and acting mentally (developing a mental image or enhanced capability that enables learners to apply the learned concepts to other similar situations) (Engeness, 2021). Agentic learners can also orient the learning processes in their own ways by their own means (Singh & Engeness, 2021). Online learning environments provide a vast array of resources for academic references. Learners engage privately with their own colleagues, peers or others for learning; they can use other interactive learning resources, such as video interviews or podcasts with experts on particular topics, and the MOOC is a rich

learning environment because it contains various resources for supporting learners. For example, video resources can guide academic references for developing scientific concepts. Those learners looking for direct, face-to-face interaction can choose to engage with peers and instructors in an institutional xMOOC that aims to develop students' professional digital competence.

However, scholars have questioned the transformative capabilities of current MOOC-driven teaching and learning practices because of their emphasis on information transmission rather than the innovation of pedagogical approaches (Reich, 2020). Reich (2020) argued that implementing innovative pedagogical design thinking is required to realise MOOCs' disruptive and transformative potential. Engagement, interaction and collaboration lead to innovation and transformation (Harasim, 2017). Therefore, it is crucial to investigate how students perceive the existing learning resources in the MOOC offered by HEIs to develop their professional knowledge because this can contribute to designing and offering good learning resources for promoting students' engagement in an online learning environment where students remain remotely located and often unknown to fellow learners and instructors.

One of the notable differences between the conventional MOOCs offered by big MOOC providers such as Coursera, edX and FutureLearn and institutional xMOOCs (e.g., ICTPED MOOC) is that students' learning activities are rigorously followed and addressed by course instructors and students in and through discussion forums and online guidance meetings with teachers. Because of the lack of teacher engagement in students' learning, there is a large number of student drop out in conventional MOOCs (Mehrabi et al., 2020; Singh & Mørch, 2018) as opposed to accredited institutional xMOOCs. However, in institutional xMOOCs, instructors have the responsibility to follow, assess and guide students' learning activities so that students can enhance their performance and complete the course. Therefore, they remain active in discussion forums, especially on Facebook and Canvas, to answer students' questions and arrange meetings to help them solve their problems. Students are also offered online voluntary learning meetings with instructors, as well as with fellow students in institutional MOOCs. There might be several factors regarding the successful continuation of the institutional xMOOCs. For example, flexible learning opportunities, instructors' ambition to build a digital professional identity, good teacher support and supervision of students' learning and added professional

advantages, as well as digital competence development, are some of the key focus areas in teacher education in Norway. Sustained government support for expanding digital teaching and learning practices, such as MOOCs in Norway, here initiated with support and funding from the government (Tømte et al., 2020), can be one of the crucial factors to the continuity of formal MOOCs.

To sum up, the literature has highlighted students' engagement in MOOCs as one of the crucial aspects of students' learning and reducing dropout rates. Most studies are quantitative and focus mainly on the behavioural aspect of students' engagement, but social engagement remains fully unexplored. Engaging with various resources might also promote students' agency in learning, but these studies remain scant. The current study aims to explore how students perceive and experience their engagement with various resources in institutional xMOOCs, leading to fostering their transformative learning.

Methodology

Methods and Data

Postcourse surveys were constructed and administered by the course management team as the primary data materials used to explore students' perceptions and experiences of learning with various learning resources in the ICTPED MOOC. We selected the surveys from 2016 to 2021, which generally contained 33 questions with significant variations in response rates—the minimum response rate was 12 and the maximum 142. Nearly half of the survey questions had both closed-ended (quantitative) and open-ended (qualitative) data. The quantitative surveys were based on Likert scale rating scales (5–6). Therefore, the study can be called a longitudinal survey because almost the same questionnaires were used every year to collect data about students' perceptions and experiences of learning in the ICTPED MOOC (Creswell & Creswell, 2018). However, some questionnaires were not found in the postcourse surveys from 2016 to 2018. Therefore, some selected survey data contained information only from 2019 to 2021. For qualitative survey data (open-ended responses), we selected the postcourse survey of the ICTPED MOOC 2020. The survey questions selected for the analysis as provided in Table 6.1.

Table 6.1 Survey questions selected for analysis

1. What is your total assessment of your course?
2. How did you engage in learning in the course?
3. How important were the assignment tasks?
4. How important were the video resources for your learning?
5. How important was the feedback you received from your peer (peer review)?
6. How important were the multiple-choice questions for you?
7. How important was the individual guidance you received from course instructors or facilitators?

Source Authors' own

Data Analysis

Seven questions from the postcourse surveys were selected for analysis. The primary purpose of selecting 7 out of the total 33 questions was that the questions chosen were found to be more suitable to gain insights into students' perceptions and experiences of engagement in different learning tasks provided to them to support their learning. Because the responses to quantitative survey questions were extremely unevenly distributed, we used them to examine the trend of engagement that had developed since the start of the course. Therefore, we limited ourselves to a simple descriptive analysis (trend of frequencies) of survey responses.

Open-ended responses, which can be called qualitative surveys, were analysed using thematic analysis (Braun et al., 2021). We used the selected survey questions to thematise open-ended responses. Thus, this can also be called deductive thematic analysis, in the sense that the selected themes were already present in the survey questions. The purpose of using thematic analysis was to provide a more nuanced understanding of the students' perceptions and experiences of taking part in the course. Details of the thematic analysis are presented in Table 6.2.

Findings

In this part of the chapter, we address the findings from our study. This will be done in two parts. First, we will describe the learning design of an institutional xMOOC, which includes explaining the learning design, while in the second part, we will address the students' experiences and perceptions of learning resources.

Table 6.2 Procedures of thematic analysis

	Steps	*Activities*
1.	Gaining familiarity with data	(Re-)reading survey questions, translating, and discussing them with course instructors
2.	Generating themes	Survey questions used as themes
3.	Searching for the themes	(Re-)reading open-ended responses to find new themes
4.	Reviewing the themes	Listing themes, combining or collapsing the themes
5.	Defining and naming themes	Naming and defining themes
6.	Reporting the themes	Presenting themes with definitions in the findings

Source Authors' own

The Learning Design of an Institutional xMOOC

To analyse the effectiveness of learning resources, the learning model of the institutional xMOOC must first be explained. In 2014, the institutional xMOOC was first conceived among a group of teacher educators working at a Norwegian university college offering credit-bearing online studies in continuing education for teachers in topics related to digital learning and education. The educational model has been used in delivering an online course that trains teachers in the pedagogical use of digital technologies, called ICTPED MOOC (Information Communication Technology Pedagogical Massive Open Online Course). ICTPED MOOC has the goal of being organised in a similar way as online courses offered on Coursera and FutureLearn, that is, being open, asynchronous, flexible and scalable. For example, the ICTPED MOOC has a flexible enrolment date: students can join the course a month before/after it has started but often need general entry requirements for higher education to become students. Moreover, to obtain study credits, a student must complete several obligatory learning activities and submit exams about lesson planning. The ICTPED MOOC has been offered as an online university course since 2016 and has roughly 400 students for each run. A majority of the students are teachers working in elementary schools. The online course uses Canvas as the learning platform.

Addressing the learning design of an institutional xMOOC closer, however, a look at learning models employed in MOOC is relevant. Conole (2015) argued that the distinction between xMOOC and

cMOOC is too simple and suggested five MOOC models: associative, cognitive, constructivist, situative and connectivist. The difference between these is their underlying pedagogy. For example, an associative MOOC focuses on individual and operant conditioning and employs a learning design where drill, practice and assessment are important learning activities. In a cognitive MOOC, the learners engage with a learning design in which they reflect on their learning. Constructivist MOOCs challenge the learner to activate previous experiences and knowledge, here aiming to engender new knowledge by engaging in problem-based and inquiry learning. In situative MOOCs, the learner engages in a virtual learning environment through dialogue with other learners, while a connectivist educational model emphasises that peer learning occurs in network and distributed contexts. In this regard, when applying Conole's classification scheme, however, we can place an institutional xMOOC between the associative and associative educational models. In other words, this MOOC type is individual and based on operant conditioning, where the student engages in drill and practice learning activities, here supplemented with some degree of contemplating over the student's own learning.

Classifying the ICTPED MOOC as an institutional xMOOC, it comprises two central components that structure and run the online course. First, the student enrols in an asynchronous online course and follows a prearranged learning trajectory consisting of learning goals, learning material, learning activities and assessment forms. The ICTPED MOOC uses a model setup and is essentially a lecture-centric campus pedagogy. Each module has more or less the same learning design. In them, the students follow an interlinked and thematically prearranged learning path that teacher educators have carefully designed. The student starts with an introductory page explaining the learning goal and what is to be learned. Thereafter, the student watches a short video or reads a text before doing various learning activities in which learning contents can be tested or demonstrated in practical assignments. Such prearranged learning resources can be practice quizzes with automated formative feedback, small or larger assignments, peer assessment, discussion threads in a discussion forum and module tests. Second, the student is supported by a team of teacher educators and student assistants who provide ongoing formative feedback on assignments and are available in discussion forums, social media and video conference tools to help with practical and technical matters. The ICTPED MOOC contains seven modules, runs for five

months, and the student has an estimated workload of 20 hours per week. A module from ICTPED MOOC is presented in Fig. 6.1.

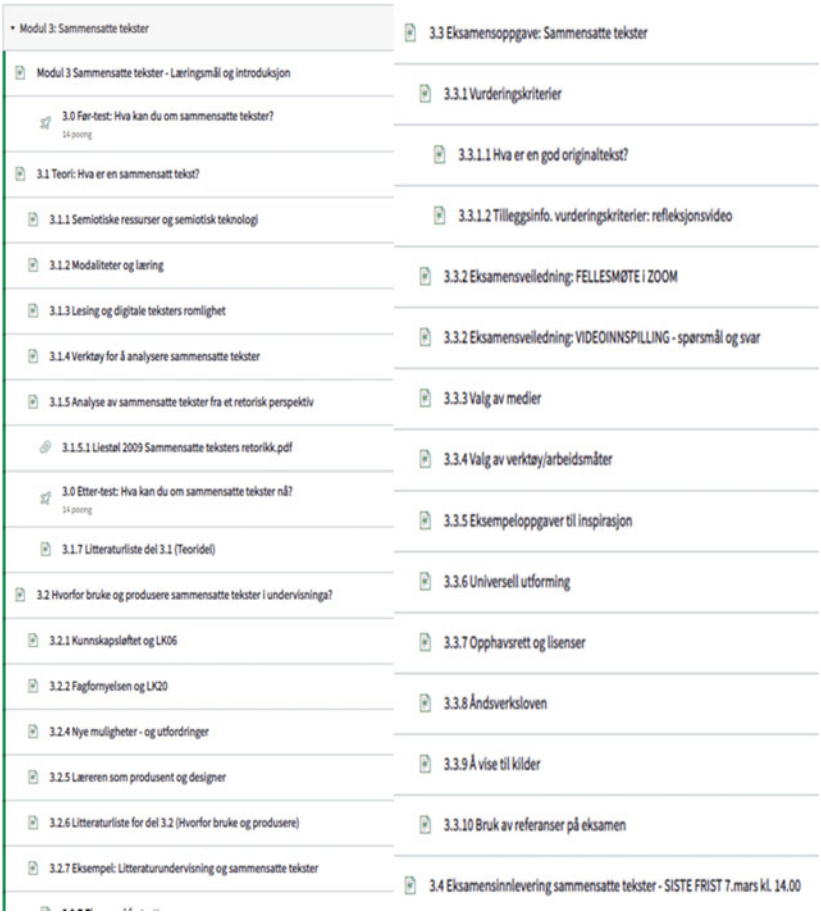

Fig. 6.1 Structure of a module in the ICTPED MOOC (*Source* Authors own)

Student Assessment of the Institutional xMOOC

Overall Assessment of the Course

This theme concerns students' overall perceptions and experiences of the course content, structure, presentation and learning activities in the ICT PED MOOC. The analyses of the students' postcourse surveys from the course's inception in 2016 to 2021 showed that most of the respondents were satisfied with the course structure and organisation. Only a few students expressed dissatisfaction (Fig. 6.2).

However, qualitative data showed nuances in the students' perceptions and experiences of learning in the course. Students had very positive experiences with video tutorials. '*I watched videos multiple times and did multiple-choice questions*' (S1). The course had some '*unnecessary texts*' for some students (S2). Most respondents (57/64) found the course content and activities well organised. For some students, the course content was challenging and intellectually demanding, as one student reported:

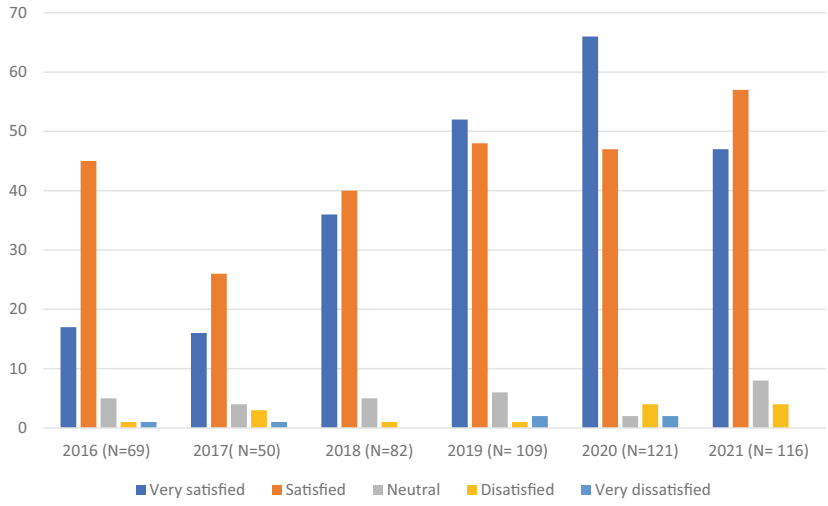

Fig. 6.2 Students' overall assessment of the course (*Source* Authors' own)

> *Despite the rumours that the course is highly demanding, I joined the course because I like ICT very much. The whole process was a very encouraging and rich learning experience. As Fred De Vito says, 'If it does not challenge you, it does not change you'. The course has changed me, and now I can use digital resources and equipment in my class. This course should be made mandatory for all teacher students.* (S3)

Some struggled to understand the assignment task in module six and reported, '*I only knew about what the assignment actually asked for after I read my fellow student's assignment*' (S4). They liked the multimodal texts. Some of them downloaded the pdf version of the modules and video tutorials to learn about their own space and place. In general, they reported that they were satisfied with the course content and learning activities because the course offered multiple communication channels and ways of learning. One student reported this as follows:

> *I had collaborative learning meetings with fellow students every week and more frequent meetings during exams. Multimodal texts were very convenient for learning. Multiple-choice tests were very useful to check my understanding of the course content.* (S5)

Students' Learning Strategies

The students' learning strategies refer to the ways in which students prefer to learn in the course. The analyses of postcourse surveys of the ICTPED MOOC showed that most students preferred learning independently (i.e., using course resources and not engaging with course participants). However, if we combine the three strategies (e.g., learning with course instructors/facilitators, participants and colleagues), the category of students who preferred learning by collaborating with others becomes larger, meaning that more and more students tended to learn by engaging with others. Some students preferred learning by engaging with online resources (e.g., YouTube) (Fig. 6.3).

The qualitative data suggest that the students had mixed perceptions and experiences of learning by engaging with the course. The independent learners preferred using course resources and discussion forums. One student reported, '*I watched videos and read text and articles. I also used discussion forums and followed discussion posts but did not take part in the discussion*' (S6). Most respondents reported engaging with course instructors/facilitators and fellow students on the Facebook and Canvas discussion forums of the course. One student reflected, '*I asked many*

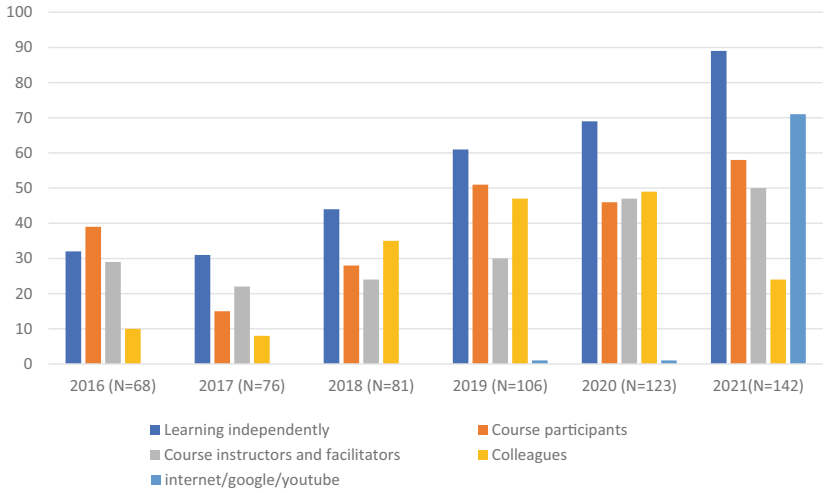

Fig. 6.3 Students' learning strategies (*Source* Authors' own)

questions on Facebook, and instructors answered my questions very quickly' (S7).

Video as Learning Resources

The ICTPED MOOC contained three types of video tutorials: orienting videos that explained how to engage in the course, tutorial videos (describing and explaining course content) and interview videos in which instructors have experts in a particular field or topic. The data showed that the overwhelming majority of the respondents were satisfied with the videos. Only a few were dissatisfied (Fig. 6.4).

The qualitative findings also suggest that most respondents (25/36) preferred learning by watching videos. One student reported that '*videos became very crucial resources for learning in the courses as I frequently watched them and checked my understanding*' (S8). Some students found the videos that contained interviews with experts over the course topic very knowledgeable and valuable. '*Interview videos were worth watching for deep learning*' (S9) because students '*gained insights into others' experiences*' (S10). However, some students found (5/36) the videos to be of a poor quality. It became much easier for some students to understand videos than the information given in written texts. The students might

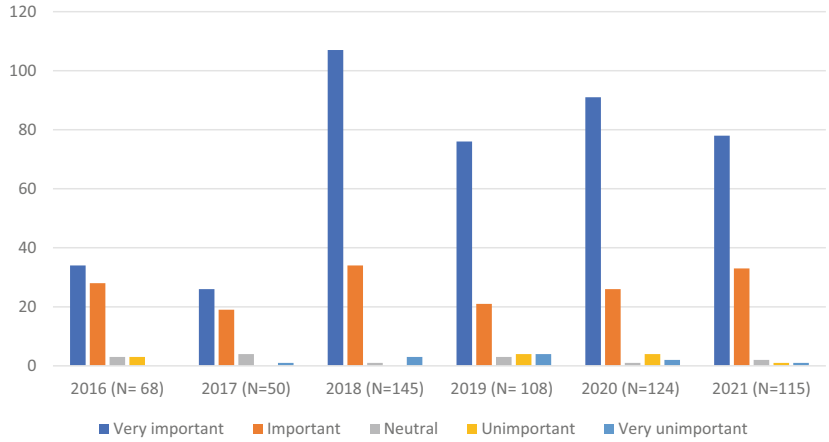

Fig. 6.4 Students' perceptions of the importance of video resources (*Source* Authors' own)

also find it challenging to learn through videos if the videos contained information without references or citations. One student stated this in the following way:

> *I learned by watching most of the videos, but some were quite long. It was challenging for me to keep track of learning resources. Obvious information should have been about it in the videos. I did not find all references in the bibliographies and spent much time looking for references.* (S11)

Learning by Doing Assignment Tasks

Assignment tasks refer to the examination assignments that students must complete to pass the course and obtain a credit point. The data show that most students found the assignment tasks crucial for their learning. A few students found them relatively unimportant for their professional practices (Fig. 6.5).

The qualitative data show that most respondents (32/45) found the assignment task very demanding and time-consuming. They spent a lot of time understanding and completing the task. One student reflected on it as follows:

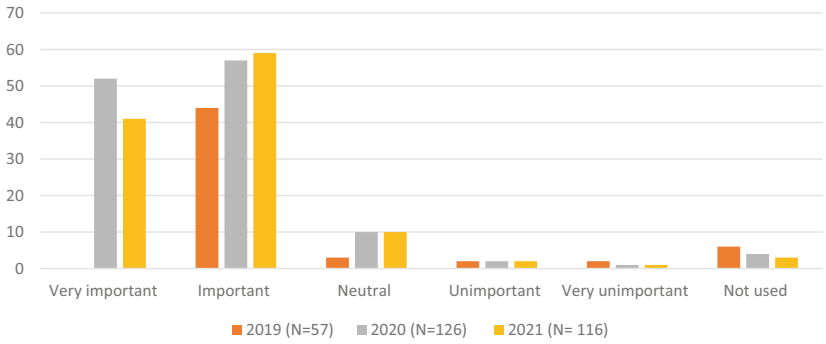

Fig. 6.5 Students' perceptions of examination assignment (*Source* Authors' own)

> *I wasted incredibly too much time on technical aspects because they did not work satisfactorily. Clear information should have been provided in advance regarding how to submit the assignment. It was frustrating to wait a week to find which Google account was to be used to submit the task.* (S12)

Some students found that exam assignments helped them learn digital skills and enhance their digital competence. As one student put it, '*This exam assignment was phenomenal. The assessment criteria were clearly well designed, and completing the first draft was great*' (S12).

Learning by Peer Feedback (Peer Review)

The students had mixed perceptions of peer feedback. Many students perceived peer feedback as important for their learning, but nearly half of the respondents were undecided about whether peer feedback was beneficial for them to enrich their learning experiences. Some students found it unimportant (Fig. 6.6).

The qualitative data also showed mixed experiences regarding peer feedback. Most students (43/61) found peer feedback helpful in expanding their learning. '*Peer feedback helped me generate new ideas*' (S13). They gained insights into how others could understand their tasks; as one student said, '*To see how others could understand my work was fruitful in creating a good task*' (S14). It became a good practice for some students to learn how to give feedback as well; as one student put it, '*I learned and became aware of how to give short and good feedback*' (S15).

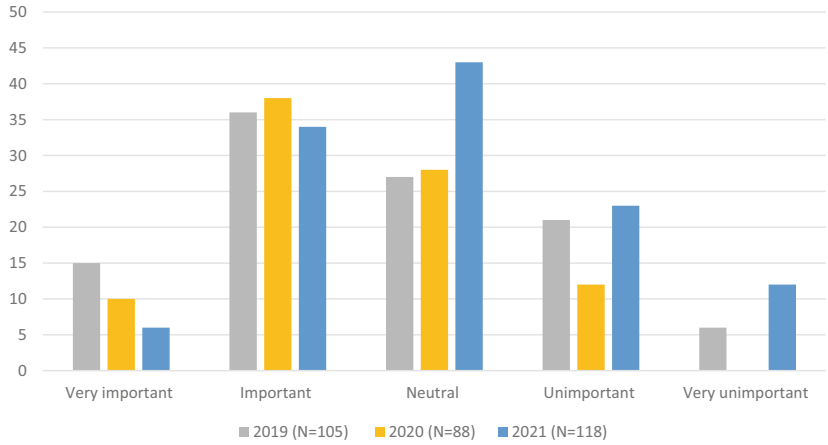

Fig. 6.6 Students' perceptions of peer assessment (*Source* Authors' own)

However, some students reported that they only slightly benefited from peer feedback because their fellow reviewers failed to offer good feedback or gave entirely unrelated feedback. One expressed his experience: '*I received feedback unrelated to my assignment task*' (S16). Peer feedback might raise the issue of privacy and personal data sharing in online learning. One student observed the following:

> *I like the concept, but do not like someone I do not know to watch my videos. This is unusual. I feel comfortable sharing my stuff with course instructors and facilitators, but not with those I am not known to.* (S17)

Some students did not know whether they had learned something by peer review. One student reported this experience as follows:

> *I do not know whether I learned something by reviewing fellow students' tasks. I was assigned a long and messy text (about 1500 words) and spent much time reading and understanding it. It was stressful, and I think it was also a waste of time. It could have been much better if we could have discussed our ideas in online meetings.* (S18)

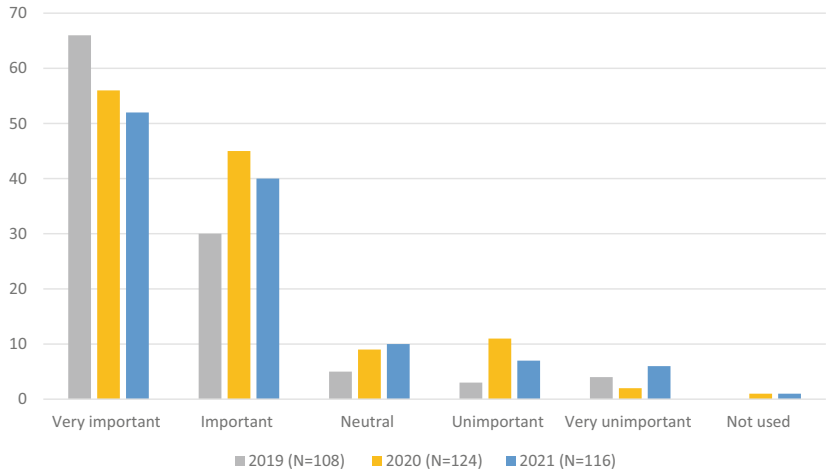

Fig. 6.7 Students' perceptions of automated quizzes (*Source* Authors' own)

Learning by Doing Multiple-Choice Questions

Most of the students found multiple-choice questions crucial for their learning. Some were undecided about the usefulness of multiple-choice questions for learning. A few found them unimportant (Fig. 6.7).

The students found multiple-choice questions (automated quizzes) necessary for their learning. Quizzes helped students learn and know key points about the topic of learning; as experienced by a student, '*Quizzes helped me learn key points in the syllabus*' (S19). While completing quizzes, they went through learning resources (e.g., videos, texts and reference materials) to check the answer. They also used additional resources for doing quizzes. One student reported the following:

> *I found multiple-choice questions beneficial for my learning. I repeatedly read texts and watched videos and other resources to answer the quizzes. They motivated me to scan the learning resources carefully.* (S20)

Individual Guidance from Instructors

The students were offered opportunities for individual meetings with course instructors/facilitators to solve their problems. These meetings were called individual guidance with instructors. Most students who sought individual guidance from course instructors/facilitators found

them important for their learning. Some students were undecided about whether participating in individual guidance meetings was useful. Some found them not useful in solving their problems (Fig. 6.8).

The qualitative data also show that students received the expected support to solve their problems in the individual guidance meetings. The students found them constructively useful for their learning because they received good tips and advice for improving their tasks. As one student reflected on his experience, '*I felt confident that I would get support if I got problems. It was very reassuring and motivating to get good support from instructors*' (S21). They appreciated the patience and service mindedness of instructors/facilitators '*Instructors were calm and service minded to help us solve our problems*' (S22). Some students had the preconceived idea that receiving instructors' support in an online learning environment would not be easy, but it turned out to be much easier. One student reported, '*I was surprised by how easy it was to get help from instructors. It had trouble submitting a large exam file, but instructors helped me in the individual meeting*' (S23). Some students hesitated to participate in individual guidance meetings on unfamiliar platforms for meetings, but the instructors made them feel comfortable in new spaces. One student

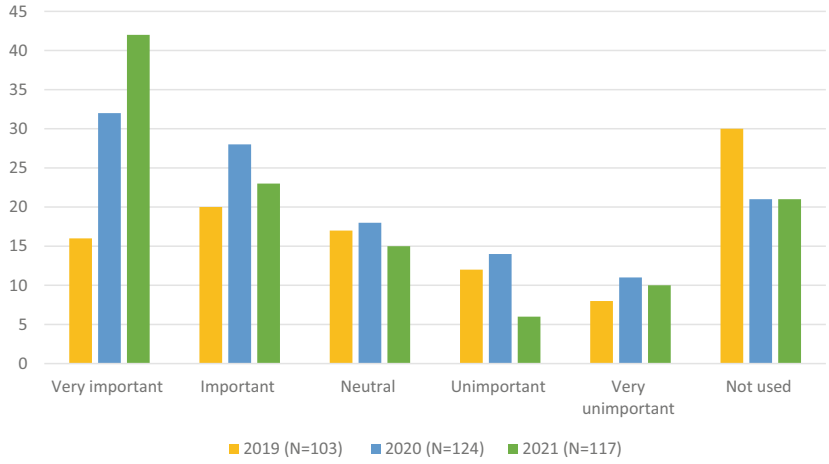

Fig. 6.8 Students' perceptions of individual guidance meeting (*Source* Authors' own)

reported, '*I was terrified to knock on the Whereby conferencing platform for the first time, but the facilitator made me feel good. I received sound advice and support from her*' (24).

Discussion

The findings have demonstrated that most students were satisfied overall with the given course resources and activities in the ICTPED MOOC, finding them useful in developing their understanding of learning tasks. The learning resources, especially audio and video texts, helped students scaffold their learning because they frequently revisited them to make sense of and check their understanding of the learning content. This finding corroborates with the findings of previous research, which has documented that students engaged in audio–video and written texts to develop their understanding and to solve their learning problems by repeatedly interacting with these resources (Engeness et al., 2020). Videos can become intellectual materials that can assist students in shaping a logical understanding of course materials, which may engender transformative learning in online learning environments.

Second, most of the students found assignment tasks demanding and crucial to enhance their learning. The tasks helped students use, assess and develop their digital skills and competence because they had to create an instructional video and a reflection video explaining how they created the examination task and why they chose a particular approach to content organisation and presentation. It was a rewarding learning experience for most students. Knowing what, how and why one has done something can transform students' learning—developing their enhanced capability in understanding something that can be applied to other situations to solve similar or different problems (Arievitch, 2017; Engeness, 2021). However, some students spent a lot of time making sense of assignments and figuring out technical issues, such as which tools to use to create assignments and how to submit the completed assignments. A challenging situation can also be productive because it demands active action to resolve the situation, as the concept of double stimulation implicates (Aagaard & Lund, 2019). Also, nearly all the students found quizzes useful resources for engaging with course materials. While doing the quizzes, the students repeatedly scanned and skimmed course resources to consolidate their understanding. Thus, quizzes might drive students to consult with and pay detailed attention to various learning

resources. Regularly scheduled quizzes on reading materials may increase the completion of reading assignments and, therefore, course performance (Johnson & Kiviniemi, 2009).

Third, most students found human resources, especially individual guidance meetings with course instructors, crucial to their learning. Individual students engaged with course instructors or facilitators to develop their understanding of their problems and solve these issues constructively. They found instructors showing good professional qualities, such as being motivating, assuring and willing to offer support to students to solve their problems. As indicated by a previous study, students have their ideas assessed when they engage with instructors, leading to strengthening epistemic validity of students' ideas (Singh & Engeness, 2021).

Another important human resource in the MOOC was peer assessment. The majority of the students found peer assessment to be generative, guiding and useful in deepening their understanding of solving their learning problems. However, some students raised questions about the quality of peer feedback and misunderstandings. Previous studies have reported that peer feedback promotes students' engagement and learning in MOOCs (Gamage et al., 2021). Peer feedback can be one of the important factors for reflectively generative aspects of transformative learning because our understanding is shaped and expanded in and through our interaction with peer or peer ideas (Singh, 2022). Some students raised questions regarding the issue of privacy and personal data sharing with fellow participants that the students were unfamiliar with. Videos that were shared with peers for assessment containing raw personal data were sometimes seen as formidable obstacles to promoting peer interaction in online courses in general.

Finally, the findings show that the students preferred to learn both independently and collaboratively in the course. This suggests that students need resources for independent learning and collaborative learning. Independent learners engage in self-directed learning, while social learners prefer learning by interaction and collaboration with others. Several previous studies have indicated the need to embed clearly stated information for students' self-directed learning (Alonso-Mencía et al., 2020), as well collaborative aspects, in MOOCs (Amarasinghe & Hernández-Leo, 2019). Although the scripts for promoting engagement can be crucial techniques for engagement, when it came to intellectual engagement, the students required quality resources for independent

learning and motivating social interaction in MOOCs. As Dewey (1933) stated, one's thinking provides guidance for others' thinking. The subject matter that institutional xMOOCs offer is the syntheses of scientific concepts (systematic, logical ideas) (Vygotsky, 2012) that instructors have developed to support students' learning activities. By engaging with course materials and course participants, students can transform their learning, which here means developing a scientific understanding of course content and practical experiences.

How Can Learning Resources Contribute to Transformative Learning?

The findings of the current research study indicate that the selected resources assisted the students in engaging in learning. The students frequently used the audio and video resources to understand the course content and solve the given tasks, such as quizzes and assignments. They found solving examination assignments challenging because they had to create a pedagogical task and reflect upon the whole process of creating and solving the assignment. Students' interaction with instructors (individual guidance meetings) and peers (peer interaction) could also assist the students in enhancing their ability to make sense of learning tasks and constructively solve problems. The students wanted to learn independently or engage in self-directed learning collaboratively or by interacting with instructors and fellow students. These findings indicate that the existing resources in the ICTPED MOOC could invoke transformative learning if it is conceived as processes of developing, expanding and advancing systematic understanding or scientific understanding of learning tasks or how to solve learning problems systematically or scientifically by engaging with learning resources: both human and nonhuman resources (Vygotsky, 2012). Critical thinking is developed when we engage with others' thinking (Dewey, 1933) or when we interact with others using various mediating tools, such as videos and language (Vygotsky, 2012). Thus, engagement, either vicarious (engagement with written text or pictures) or direct (interaction with instructors and peers), is required for engendering transformative learning experiences.

We assume students who have developed some knowledge and skills of learning independently online may require more specific guidelines and additional resources for their self-directed learning (Zhu, 2021). From a cultural-historical perspective, agentic students who know how

to engage meaningfully can orient their own learning processes systematically (Engeness, 2021). As indicated by the findings, most of the students preferred learning independently, suggesting that students are capable of engaging in self-directed learning activities. This group of students can be considered agentic students because they might know how to use course resources independently in the course. Therefore, previous studies have suggested offering students clear guidelines and strategies for fostering self-regulated learning (Jansen et al., 2020). We have also assumed self-directed learning as a characteristic of agentic students because they may know how to strategically navigate and use existing resources such as videos for understanding course content and solving their learning problems. Self-directedness in the course might be a characteristic consequence of online learning environments where students remain remotely located and unfamiliar with one another, hence forcing them to choose an independent path of learning (Singh, 2021), but this crucial issue merits further investigation. The number of students who tended to learn by engaging with human resources (teachers, peers and colleagues) has increased in the course since the course was first created, indicating that students need engagement and collaboration with knowledgeable others to understand course content and solve their problems. For them, human scaffolding is crucial in fostering their learning. Engaging in interactions with more knowledge others can promote students' capability to learn systematically (Vygotsky, 2012). From the perspective of developmental teaching and learning, students can develop enhanced capabilities to think critically and solve problems constructively by engaging with human resources (Arievitch, 2017). When we engage in learning to solve our problems in collaboration, we get the opportunity to enact, realise and develop our agency in learning. Agency and transformative learning experiences are two sides of the same coin (Stetsenko, 2017). Therefore, we claim that existing resources in the ICTPED MOOC may have contributed to transformative learning experiences. Transformation is a process of engaging individually and collectively in learning and fostering intellectual quality in understanding, interpreting and solving problems scientifically.

Conclusion and Pedagogical Implications of the Findings

Developing positive feelings and attitudes towards learning resources can motivate students to actively engage with learning resources to develop their understanding of how to solve their learning problems. Engagement also increases students' retention rates in the course. Therefore, course instructors should develop and deliver those resources that students deem necessary to enhance their learning and competence.

Another important finding is that the students wanted to adopt both self-directed learning and collaborative learning approaches, suggesting two categories: self-directed students who know how to use online resources independently and social learners who want to deepen their learning by engaging with course instructors and peers. Designing resources that can cater to the needs of these two groups of students is essential but demanding as well. However, why students tend to learn independently has yet to be established.

Developing scientific understanding demands sustained engagement and interaction with learning resources, which can guide the process of understanding. Institutional MOOCs offer multimodal learning resources, leading to the promotion of multimodal learning. Multimodal resources have the potential to promote learning at one's own pace, in one's own spaces and with one's own tools. This may be one of the distinguishing features of online learning that can ensure transformative learning. Systematically organised learning resources might provide a scientific reference for students to understand, interpret and transform their practice-related experience and knowledge claims, leading to epistemic transformation (scientific understanding, developing adequate knowledge about the topic of the discussion and enhanced capability). However, such possibilities remain peripheral because students have limited opportunities to interact intellectually with fellow learners and instructors. Existing interactions tend to promote problem solutionism rather than becoming a reflective and discursive inquiry about issues, which might be a barrier to epistemic transformation. Communication, interaction and collaboration about developing and advancing a conceptual understanding of learning problems is required for epistemic transformation because it involves putting forward, explicating, questioning and assessing knowledge claims. Such processes demand sustained co-engagement and co-contribution to make sense of learning resources and problems.

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