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Online learning at the post-graduate level: Interpretations through Bloom's revised taxonomy

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ABSTRACT This study aimed to identify the perspectives of post-graduate students on online learning in the field of educational sciences utilizing Bloom's revised taxonomy specified for the cognitive domain to qualitatively explore the factors affecting lower-order thinking skills (LOTS) including remembering, understanding, and applying as well as higher-order thinking skills (HOTS) composed of analyzing, evaluating, and creating. The participants for this investigation were comprised of 20 post-graduate students who had enrolled in at least one online course within the field of educational sciences in Türkiye during the academic year 2022-2023. The collected data from interviews were analyzed by adopting the "directed qualitative content analysis" (DQICA) and using the MAXQDA 2020. The results of the DQICA revealed three themes with the connected codes and categories; namely, factors for (1) abilities, (2) inabilities, and (3) expectations aligning with the LOTS and HOTS of Bloom's revised taxonomy. Overall, the findings suggest that the design and management of online learning environments play a crucial role in facilitating both LOTS and HOTS in higher education.

Keywords: *Bloom's taxonomy, Cognitive approach, Online learning, Post-graduate students*

Lisansüstü düzeyde çevrimiçi öğrenme: Yenilenmiş Bloom taksonomisi açısından bir değerlendirme

ÖZ Bu çalışma, eğitim bilimleri alanındaki lisansüstü öğrencilerinin çevrimiçi öğrenmeye dair bakış açılarını Bloom'un bilişsel taksonomisi çerçevesinde ortaya koymayı amaçlamaktadır. Bu doğrultuda, çalışma ile Bloom'un yenilenmiş taksonomisi ışığında bilişsel alan için belirlenmiş olan alt düzey düşünme becerileri (ADDB) olan hatırlama, anlama ve uygulama ile üst düzey düşünme becerileri (ÜDDB) olan analiz etme, değerlendirme ve yaratma süreçleri ile ilgili olarak çevrimiçi öğrenme sürecini etkileyen faktörler belirlenmiştir. Çalışmanın katılımcıları, Türkiye'de eğitim bilimleri alanında 2022-2023 eğitim yılında en az bir çevrimiçi ders almış 20 lisansüstü öğrenciden oluşmaktadır. Görüşme yöntemi ile toplanan veriler, yönlendirilmiş nitel içerik analizi (YNİA) yöntemi ile MAXQDA 2020 analiz programı kullanılarak analiz edilmiştir. Elde edilen bulgular, ADDB ve ÜDDB'ler ile uyumlu şekilde katılımcılar açısından (1) yeterliklere ilişkin faktörler, (2) yetersizliklere ilişkin faktörler ve (3) beklentiler olmak üzere üç tema altında toplanmıştır. Sonuç olarak, bulgular doğrultusunda yükseköğretim düzeyinde çevrimiçi öğrenme ortamlarında hem ADDB hem de ÜDDB'lerin geliştirilebilmesi açısından çevrimiçi öğretim tasarımının ve sınıf yönetim becerilerinin kritik önemi vurgulanmaktadır.

Anahtar Sözcükler: *Bilişsel yaklaşım, Bloom taksonomisi, Çevrimiçi öğrenme, Lisansüstü öğrencileri*

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INTRODUCTION

To understand the changes brought about by digitalization in learning processes, in the field of education, it is a center of interest to investigate how learning occurs online, especially in the post-pandemic period. Various theories and models explain learning processes in educational sciences, and among these, one of the most commonly used models in the literature is Bloom's taxonomy of learning. Bloom et al. (1956) designed a taxonomy of learning to assist instructors and educators in assessing the learning outcomes of the intended curricula based on the determined learning objectives. Bloom's taxonomy of learning categorizes learning into three different domains: cognitive, affective, and psychomotor behaviors (Bloom et al., 1956). Of these three types of measured behaviors, the cognitive taxonomy has been focused more on by educators and researchers because of its appropriateness for higher levels of education (Halawi et al., 2009). In other words, the cognitive domain renders the assessment of learning outcomes possible for higher education.

In the cognitive domain, Bloom et al. (1956) originally developed a six-level taxonomy defined from simple to more complex levels of thinking as "knowledge, comprehension, application, analysis, synthesis, and evaluation". These levels in the cognitive taxonomy were grouped into two sections as lower-order and higher-order thinking skills including three levels in each section; namely, knowledge, comprehension, and application correspond to lower-order thinking skills (LOTS) whereas analysis, synthesis, and evaluation refer to higher-order thinking skills (HOTS). LOTS are essential to further develop deeper learning by providing basic components required for HOTS that enable critical thinking and problem-solving (Hopper, 2009). Therefore, to develop the last three skills in Bloom's taxonomy, students need to achieve the first three skills in the taxonomy.

In the 2000s, Anderson and Krathwohl (2001) revised Bloom's cognitive taxonomy of learning by changing the levels to "remembering, understanding, applying, analyzing, evaluating, and creating" and adopting a knowledge domain consisting of four types of knowledge; namely, factual, conceptual, procedural, and metacognitive knowledge (Wilson, 2016). In its revised version, the knowledge domain was reconstructed as four types of knowledge. Krathwohl (2002) described factual knowledge as "the basic elements that students must know to be acquainted with a discipline or solve problems in it"; conceptual knowledge as "the interrelationships among the basic elements within a larger structure that enable them to function together"; procedural knowledge as "how to do something; methods of inquiry, and criteria for using skills, algorithms, techniques, and methods"; and metacognitive knowledge as "knowledge of cognition in general as well as awareness and knowledge of one's own cognition" (p. 214). With the help of this revised classification of knowledge, the placement of learning objectives has been more practical for instructors to determine the learning components of the intended content. Accordingly, the revised version of Bloom's cognitive taxonomy has been widely used to optimize educational objectives (Patil & Shreyas, 2018; Tuma & Nassar, 2021), learning outcomes (Attia, 2021; Patil & Shreyas, 2018) and assessment (Attia, 2021; Dipto et al., 2023; Laddha et al., 2021; Patil & Shreyas, 2018; Ram et al., 2020), especially in traditional face-to-face instructions.

Within the paradigm of digitalization and the unprecedented changes in learning environments in the post-pandemic era, learning environments have been transformed from face-to-face to online and/or blended classes. Skylar et al. (2005) stated that e-learning environments have been more widely-distributed in the instructional delivery of higher education and teacher education. Salarvand et al. (2023) pointed to communication and cooperation issues specific to online classes in higher education. Halawi et al. (2009) listed the challenges of e-learning environments as "students' physical distance, their lack of direct responses, and the lack of restrictions over assessments" by highlighting the necessity of investigating student e-learning adopting Bloom's revised cognitive taxonomy of learning. Consistently, some previous researchers emphasized the significance of the interaction between students and instructors in online learning (Atashinsadaf et al., 2024; Dalelio, 2013; Palloff & Pratt, 2007; Wegmann & McCauley, 2014). Therefore, Tibi (2018) underlined that using Bloom's taxonomy and levels of knowledge in structured discussion forums in fully online courses enhances student motivation in learning. Similarly, Kauffman (2015) stated that "the online learning environment presents a unique

challenge on how to engage students in developing discipline-specific conceptual and procedural knowledge" (p. 6). Accordingly, it is significant to reconsider student online learning environments from the cognitive perspectives of Bloom's revised taxonomy.

Prior research on online learning and assessment via Bloom's taxonomy is quite limited (Abuhassna et al., 2020; Alaghbary, 2021; Lin et al., 2021; Sebbaq & El Faddouli, 2022). Abuhassna et al. (2020) revealed, in a study with 243 students using online learning platforms in higher education, that there was a significant relationship between students' remembering, understanding, analyzing, applying, and academic achievement. Similarly, Alaghbary (2021) detected, in a study with second-year undergraduate students of English, that students achieved learning at the highest level of Bloom's taxonomy in a virtual environment designed with Web 2.0 tools. Barari et al. (2022), in their mixed-method study, aimed to develop and validate educational standards and indicators specifically tailored to e-learning environments, and two educational standards and 18 crucial indicators based on the Bloom-Anderson Taxonomy were developed and validated as the study's main results. From a pedagogical standpoint, these standards and indicators offer a framework for designing and evaluating e-learning initiatives. In order to maximize the advantages of learning technologies, they emphasized the significance of adhering to pedagogical standards. Consistently, Sebbaq and El Faddouli (2022), in their study modelling a large-scale classification of Massive Open Online Courses (MOOCs) based on students' learning objectives and Bloom's taxonomy, investigated the pedagogical framework of e-learning systems "served as a standard to unify the representation of MOOCS and facilitate interoperability between MOOCs platforms" (p. 171).

Although there are a few quantitative studies in the field, there is a research gap in terms of qualitative studies on students' perspectives on their learning during online education based on Bloom's revised taxonomy in the post-pandemic period. Besides, the transition of learning environments from face-to-face to online form leads to several issues related to communication and interaction (Ruan & Yang, 2021; Salarvand et al., 2023), engagement (Kauffman, 2015; Yang et al., 2022), effectiveness (Meng et al., 2023; Tomak & Atas, 2023), learning outcomes and assessment (Ilgaz & Afacan Adanir, 2020; Broadbent, 2020; Dewa, 2022; Efthymiou, 2023; Kilickaya, 2023) in higher eduction. Therefore, this study aimed to identify the cognitive perspectives of post-graduate students on online learning in the field of educational sciences utilizing Bloom's revised taxonomy specified for the cognitive domain. Post-graduate level in the field of educational sciences was specifically investigated because of the participants' prior knowledge in learning approaches to gain more qualified perspectives in their self-learning processes about Bloom's revised taxonomy.

METHODOLOGY

Research Design

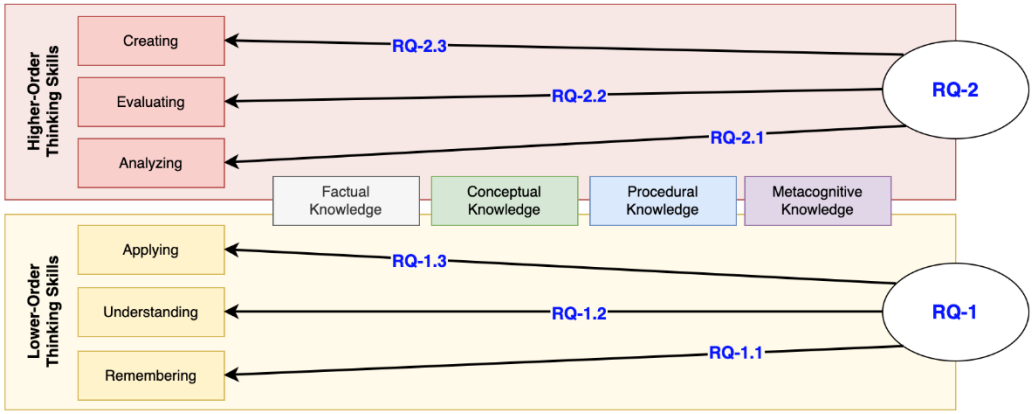
Employed as a qualitative approach, the present research aimed to identify the cognitive perspectives of post-graduate students on the factors affecting online learning in the field of educational sciences utilizing Bloom's revised taxonomy for the cognitive domain. The following research questions (RQs) were investigated to learn about post-graduate students' cognitive reflections based on LOTS and HOTS:

RQ-1: How do post-graduate students reflect on the factors affecting LOTS in online learning?
RQ-1.1: What are post-graduate students' opinions about the factors affecting their remembering of newly-presented information in online learning?
RQ-1.2: What are post-graduate students' opinions about the factors affecting their understanding of newly-presented information in online learning?
RQ-1.3: What are post-graduate students' opinions about the factors affecting their applying of newly-presented information in online learning?

RQ-2: How do post-graduate students reflect on the factors affecting HOTS in online learning?
RQ-2.1: What are post-graduate students' opinions about the factors affecting their analyzing of newly-presented information in online learning?
RQ-2.2: What are post-graduate students' opinions about the factors affecting their evaluating of newly-presented information in online learning?
RQ-2.3: What are post-graduate students' opinions about the factors affecting their creating of newly-presented information in online learning?

To qualitatively explore the cognitive perspectives of post-graduate students on the factors affecting learning in an online environment, Bloom's revised taxonomy was used as the basis of the study, and four types of knowledge were emphasized in the interpretation process; namely, factual, conceptual, procedural, and metacognitive knowledge representing a taxonomy from concrete to abstract thinking. The research design is illustrated in Figure 1.

Figure 1.
The Research Design



As depicted in Figure 1, RQ-1 was constructed to identify the factors affecting LOTS including remembering (RQ-1.1), understanding (RQ-1.2), and applying (RQ-1.3) whereas RQ-2 was formulated to find out the factors affecting HOTS composed of analyzing (RQ-2.1), evaluating (RQ-2.2), and creating (RQ-2.3). In the model, four types of knowledge were also examined with a taxonomy-based approach.

Participants

By following the RQs, purposeful sampling was employed to reach the participants. The inclusion criteria were as follows; they were post-graduates in educational sciences and had taken at least one course online during their post-graduate education. The participants were selected through purposive criterion sampling and snowball sampling methods, which are non-probability sampling techniques (Yıldırım & Şimşek, 2021). In snowball sampling, researchers start with a small number of information-rich interviewees. These initial interviewees are then asked to recommend others relevant to the study (Patton, 2015). This referral process creates a chain of participants, and using their social networks allows researchers to gather thorough qualitative data, leading to a deeper understanding of the research topic. In this study, the participants were purposefully selected as students from educational sciences at the post-graduate level because it was envisaged that they might have prior knowledge so that they could understand and reflect on their self-learning processes by answering the questions about Bloom's revised taxonomy. Beyond the initial interviews, the remaining interviews were obtained by consulting them. Therefore, the participants consisted of 20 post-graduate students who had attended at least one online course in the field of educational sciences in Türkiye. All participants were anonymously labeled, such as P1, P2, and P3 (…), to keep their identities confidential. The demographic profile of the participants is presented in Table 1.

Table 1.
Participant Demographics

Participants	Gender	Age Range	Field of Teaching	Tenure in Teaching
P1	F	25-30	Primary Education	6-10 yrs
P2	F	36-40	Turkish Language and Literature	11-15 yrs
P3	F	31-35	Turkish Language and Literature	6-10 yrs
P4	M	25-30	Psychological Counselling and Guidance	1-5 yrs
P5	F	41-45	Biology	6-10 yrs
P6	F	36-40	Psychological Counselling and Guidance	11-15 yrs
P7	F	25-30	Psychological Counselling and Guidance	1-5 yrs
P8	M	25-30	Turkish Language and Literature	1-5 yrs
P9	F	31-35	Pre-school Teaching	1-5 yrs
P10	F	36-40	Pre-school Teaching	11-15 yrs
P11	M	31-35	Primary Mathematics Teaching	6-10 yrs
P12	M	25-30	Primary Mathematics Teaching	1-5 yrs
P13	F	41-45	Music Teaching	21+ yrs
P14	M	36-40	Turkish Language Teaching	6-10 yrs
P15	F	41-45	Turkish Language Teaching	16-20 yrs
P16	F	25-30	Primary Education	1-5 yrs
P17	F	31-35	Psychological Counselling and Guidance	11-15 yrs
P18	F	25-30	Turkish Language Teaching	1-5 yrs
P19	F	41-45	Lower-Secondary Science Teaching	21+ yrs
P20	F	36-40	English Language Teaching	11-15 yrs

According to Table 1, of 20 post-graduate students, the majority were female participants (F=15; M=5). Regarding the sample's age range, seven were in the 25-30 age group, four were between 31-35, five were in the 36-40 age group, and four were between 41-45 years old. Considering the teaching majors of the participants, four specialized in psychological counseling and guidance (P4, P6, P7, P17), three in Turkish language and literature (P2, P3, P8), three in Turkish language teaching (P14, P15, P18), two in pre-school teaching (P9, P10), two in primary mathematics (P11, P12), two in primary education (P1, P16), and there was only one participant for the areas of expertise in lower-secondary science teaching (P19), biology (P5), and music (P13) each. As for the tenure in teaching, most participants had 1-5 years of experience (n=7). Five students had 6-10 years of experience, another five had 11-15 years, only one participant had 16-20 years, and two had 21 or more years of experience.

Data Collection Process

An interview form was constructed, which included two parts: demographics and interview questions based on Bloom's revised taxonomy (Anderson & Krathwohl, 2001). In the first part, the participants were asked about their demographic profile, which consisted of the items requesting information about gender, age, the field of teaching, and tenure in teaching.

In the second part, the interview questions developed by the researchers were used to collect the data. After a rigorous literature review, a pool of interview questions was created based on the types of knowledge making use of thinking skills categorized into two parts: namely, LOTS including remembering, understanding, and applying, and HOTS consisting of analyzing, evaluating, and creating in the online learning environment of the post-graduate students (Hopper, 2009; Wilson, 2016). To ensure the validity and reliability of the data collection instrument, the opinions of two experts in the field of educational sciences were taken for the pool of interview questions. Subsequently, two pilot implementations were conducted, and the feedback and reflections gathered during these stages were used to refine the questions. Consequently, two questions were removed from the list, three were redesigned, and the interview questions were finalized with six main questions, each comprising two to three sub-questions to provide description, clarification, and exemplification.

Accordingly, six main questions were constructed with several sub-questions supporting the main ones in six dimensions of Bloom's revised taxonomy. For instance, some sample questions were "Can you

understand the theoretical and conceptual topics covered in the graduate courses you take online? What are your thoughts on this?", "In your opinion, by which factors (tools, applications and/or activities, etc.) can you analyze the theoretical and conceptual information given in your online course? Could you please explain?", "After analyzing the theoretical and conceptual information covered in your online post-graduate classes, can you rearrange them for a new environment and phenomenon?". Apart from these questions, as the final question, the participants were invited to talk about any issues related to their online classrooms and learning domain that were not asked before in the interview or they did not have the opportunity to indicate.

In qualitative research, it is crucial to build up trustworthiness to make sure that the study truly portrays the participants' experiences and viewpoints and there are a few standards frequently used to succeed in it (Huberman & Miles, 1994). In the study, first and foremost, there is a high value in thorough explanations of the research environment, participants, and data-gathering techniques, which provide credibility and transferability. A purposeful sampling technique was preferred to increase the representation strength of the participants, which also helps the transferability of the findings. Expert opinion was taken in determining the interview questions, and this is an essential criterion for dependability. In addition, critically reflecting on biases was applied to enhance the confirmability of the analysis and coding. Biases and perspectives were explicitly recognized and identified before and during the research process. Assumptions and interpretations were collaboratively questioned, aiming to identify and tackle biases during the coding process. This approach helped to promote a more objective analysis.

To ensure scientific and ethical compliance, ethics committee approval was granted by the Board of Ethics affiliated with the İstanbul Kültür University Institution of Social Sciences (documented as 2022/48 and dated 17.03.2022) before the interviews were conducted. Before each interview, the participants were informed about the aim of the study and the role of the participant, and each participant approved their participation over a signed consent form. All the participants in this study consented to their participation voluntarily and were informed that they could withdraw at any time. The interviews were conducted online, and the timing of each session was arranged based on the participants' availability. During the data collection phase, every effort was made to provide a comfortable and secure online environment, and each session lasted around 25-30 minutes. In the end, 20 interviews were successfully completed with the participant group during the 2022-2023 academic year.

Data Analysis

Qualitative content analysis involves conventional, directed, and summative approaches for interpreting data (Assarroudi et al., 2018; Hsieh & Shannon, 2005). In this present study, the collected data were analyzed using qualitative content analysis with a directed approach called "directed qualitative content analysis" (DQICA). The DQICA is a powerful research methodology that can be used to analyze textual data rigorously and systematically (e.g. Rathgeber & Mantie, 2019; Sheydayi & Dadashpoor, 2023; Seker & Guney, 2012). The DQICA is based on a theoretical framework or a priori set of categories that are developed before the analysis begins (Assarroudi, et al., 2018; Hsieh & Shannon, 2005). The theoretical framework guides the coding and categorization of the data and ensures that the analysis is focused on specific RQs or hypotheses. It involves a structured and transparent process of coding and categorizing the data, which helps to ensure the reliability and validity of the analysis (Assarroudi, et al, 2018; Kibiswa, 2019).

Wide acceptance of Bloom's revised taxonomy procured that this framework can also guide in making sense of cognitive learning in digital classrooms. Therefore, the process of the methodological analysis was carried out based on Bloom's theoretical framework, which provides a strong link to the appropriateness of the qualitative methodology. The data were analyzed deductively based the Bloom's revised taxonomy. The findings were examined with a round of several intensive reading sessions and coded using the pre-determined main themes in Bloom's revised taxonomy which are remembering, understanding, applying, analyzing, evaluating, and creating. In line with these main themes, codes,

categories, and themes were derived during the DQICA process(see Appendix 1). The data were qualitatively analyzed with the MAXQDA 2020 qualitative and mixed method data analysis program, which enables moving between transcribed texts and organizing and generating code systems simple and flexible (Guetterman, & James, 2023).

FINDINGS

Decoded Factors for Lower-Order Thinking Skills in Online Learning

In the analysis, the factors for LOTS were classified under the determined dimensions of remembering, understanding, and applying in the revised taxonomy configured with the implicated codes, categories, and themes. Table 2 presents the overall findings for the LOTS.

Table 2.
DQICA Results for LOTS

Lower-Order Thinking Skills				
Bloom's Revised Taxonomy		Codes for Remembering	Codes for Understanding	Codes for Applying
Themes	Categories			
Factors for Abilities	Strengths in Instructional Design	-Assignments -Content-rich materials -Course content -Interaction -Concrete examples	-Assignments -Content-rich materials -Course content -Interaction	-Assignments -Interaction -Concrete examples
	Descriptive Actions	-Recognizing -Listing -Identifying -Finding -Matching	-Interpreting -Summarizing -Inferring -Paraphrasing -Explaining	-Carrying out -Using -Implementing
	Individual Circumstances	-Interested -Repeating opportunity -Motivated	-Interested	-Interested
Factors for Inabilities	Problems in Instructional Design	-Course content -Limited interaction -Limited lesson time	-Course content -Limited interaction	-No concrete examples -Limited interaction -Limited materials -Limited lesson time
	External Factors	-Technical problems -Various distractors	-Technical problems	N/A
	Individual Circumstances	-Not applicable to life	-Uninterested	-Fail to understand -Busy timetable -Boring atmosphere -Not applicable to life
Expectations	Interactive Learning Environment	-Various instructional methods and strategies -Effective participation	-Various instructional methods and strategies -Turning the camera on	-Effective communication -Effective participation
	Instructional Design	-Instructor guidance -Lesson plan	-Content-rich materials -Project assignments -Course content	-More application examples -Content-rich materials -Project assignments

N/A: Not Applicable

As presented in Table 2, LOTS depended on instructional design and individual circumstances. They were unachievable because of some external factors and individual circumstances, and when there were problems in instructional design. The participants expected an interactive learning environment and appropriate instructional design to have LOTS. The codes obtained for remembering, understanding, and applying are elaborated in the following sections.

Remembering Information in Online Learning

The participants mentioned the six levels of thinking skills in Bloom's revised taxonomy while expressing their opinions about factors affecting their learning skills during the online graduate courses. Accordingly, learning most often could be possible at the remembering level, which depends primarily on strengths in instructional design and individual circumstances. The participants who remember could show the skills of recognizing, listing, identifying, finding, and matching. However, the situations that made it difficult for the participants to remember were course content, limited interaction, limited lesson time, technical problems, and various distractors in the physical environment. A participant expressed the importance of interaction in online learning as follows:

> *P5: "I could remember the information for a long time if I was active in the courses and I commented on them. For example, in the Education Economy course, since the beginning of the term, it was enjoyable even though it was online. I think that the activeness of the students in online learning increases remembering. I do not recall all the content, but if it is a subject that caught my attention or if it is told over and over, I can remember it well". (Theme: Factors for Abilities; Category: Strengths in instructional design; Code: Interaction)*

Another participant linked the effectiveness of instructional design in online learning to concrete examples and interaction as follows:

> *P18: "The factors that were effective in my remembering were the abundant examples, engaging information, and discussions during the course. I can say that I remember the subjects due to the different slides and narrative styles used in the presentation of the activities or assignments requested from us". (Theme: Factors for Abilities; Category: Strengths in instructional design; Code: Interaction / Concrete examples)*

A participant who mentioned that she could not recall what she had learned in online courses explained that the reason for this was that she did not have the chance to apply what she had learned in her daily life as stated below:

> *P19: "Not being able to carry out the lesson taught online in daily life and focusing on the responsibilities of other daily tasks makes it difficult. It can become more complex as time passes. For this, making frequent repetitions helps us remember to watch the videos again. For example, I am a teacher, so it is not always possible to remember what I learned in my educational administration course because I do not have an administrative duty". (Theme: Factors for Inabilities; Category: Individual circumstances, Code: Not applicable to life)*

Overall, it was identified that they expected various and updated instructional methods and strategies, effective participation, instructor guidance, and a clear lesson plan to remember more from the online lesson.

Understanding Information in Online Learning

The participants who stated that they could understand the subjects in the online learning process indicated that this was possible with assignments, content-rich materials, course content, interaction, and individual attention. The participants could summarize, infer, paraphrase, and explain. For example, one participant stated that she could understand if the courses and program content were engaging, relevant to her life, and reinforced with concrete examples.

> *P19: "I could understand if the program is engaging, and my experiences are in the same direction. I can understand the concepts and theories via my experiences and memories. Moreover, we can grasp the idea with comparative and concrete examples". (Theme: Factors for Abilities; Category: Individual circumstances; Code: Interested)*

The post-graduate students attributed the difficulty of understanding to course content, limited interaction, and technical problems. It was difficult for them to understand a lesson if they were not interested in the subject. In this respect, one participant ascribed the inability to understand to the poorly equipped lessons, leading to low student participation, decreased interest, and concentration.

> *P15: "I cannot understand all the content. I am missing some parts. Since the interaction is not as high as face-to-face education in the classroom environment, after a while, I started to get bored and distracted. Since the distance education process was not face-to-face, there was a focusing problem. In the lessons where the lesson is not well-equipped and the student's participation is low, interest and concentration decrease after a while, and there is a problem in understanding some subjects. The lesson becomes more understandable when I participate when the instructor uses appropriate materials and methods and stimulating activities. I could only understand a little when the course was uninteresting and monotonous, and the materials and activities were insufficient". (Theme: Factors for Inabilities; Category: Problems in instructional design; Code: Course content / Limited interaction)*

They expected various instructional methods and strategies, and content-rich materials to be utilized in the lesson to understand well. For instance, one participant expressed her expectations for online classrooms as creating an interactive environment through the use of various instructional methods and strategies:

> *P6: "Turning on the cameras ensures the students focus on the lesson and the speech. In addition, group work or individual assignments that require application positively affect the understanding of the subject. For example, the review assignment in the Research Methods course provided a meaningful grounding in my mind for the subject discussed. In addition, the atmosphere and culture of the lesson that enables brainstorming or discussion can increase the effect of the course for all the students in the class. The students and the instructor can be active, and various audio and images can be present". (Theme: Expectations; Category: Interactive learning environment; Code: Various instructional methods and strategies)*

Applying Information in Online Learning

For the applying skill, which is using the knowledge and skills they have learned in new environments, the participants stated that the course should have included more interaction and concrete examples and that it was necessary to get assignments. They also mentioned that they could reach the application level easily if they were personally interested in the subject. They could provide the application with the advanced skills of carrying out, using, and implementing. According to a participant, effectively planned and implemented courses could offer ample opportunities for practice. The instructional design must be robust, with a focus on interaction and practice assignments:

> *P6: "As I mentioned, if it was an effectively planned and implemented course, I could reflect on my learnings in my daily and professional life, for example, activities or applications such as homework, etc. If the lectures are not followed with an assignment or activity, they tend to be forgotten more. We should somehow put the information into practice as much as possible. I think small practice assignments after each topic would increase the effectiveness of the lesson". (Theme: Factors for Abilities; Category: Strengths in instructional design; Code: Interaction)*

They listed the reasons for not applying, such as a lack of concrete examples in the course, limited interaction, limited materials, and limited lesson time. Besides, they stated that individual obstacles, such as a busy timetable and finding the course content boring or not applicable to life impeded applying. According to one participant, she was unable to apply or realize what she had learned because she did

not have the opportunity to see or analyze the materials that the instructor used:

> *P18: "Sometimes we could not have the opportunity to see or analyze the materials that the instructor uses in online lessons. It was again not common to present examples of drama and role-playing with the students in the classroom. Sometimes, we could not realize sample lecturing and micro-teaching as we could in real classrooms". (Theme: Factors for Inabilities; Category: Problems in instructional design; Code: No concrete examples / Limited interaction)*

Additionally, one participant noted that the course, which only included monologues and lectures, hindered practical application as it lacked concrete content.

> *P20: "I cannot put into practice what I learned during the lessons if there is monotonous lecturing. For example, I have difficulty applying what I learned in the School Supervision and Inspection course. There were just monologues and lectures, and the information was not concrete enough to use in daily life". (Theme: Factors for Inabilities; Category: Problems in instructional design; Code: No concrete examples / Limited interaction)*

Finally, the coded descriptive actions for LOTS were analyzed according to knowledge types (Anderson & Krathwohl, 2001). The results of this analysis are depicted in Table 3.

Table 3.
Coded Descriptive Actions of LOTS processing in the Knowledge Domain

Bloom's Revised Taxonomy		Knowledge Types				n	Participants (N=20)
		Factual Knowledge (What is required to do the task)	Conceptual Knowledge (Ideas, principles, theories, behaviors)	Procedural Knowledge (The skills and techniques of doing the task)	Metacognitive Knowledge (Self-awareness, using experiences, cognition)		
LOTS	Remembering	-Listing -Finding	-Recognizing -Matching	N/A	-Identifying	20	All
	Understanding	-Explaining	-Summarizing -Paraphrasing	-Interpreting	-Inferring	20	All
	Applying	N/A	N/A	-Carrying out -Implementing	-Using	17	P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P12, P13, P14, P16, P17, P18, P19

N/A: Not Applicable

As demonstrated in Table 3, except procedural knowledge, three types of knowledge were used by all the participants in the dimension of remembering whereas all the knowledge types were expressed to be utilized in the dimension of understanding. Only two types of knowledge; namely, procedural, and metacognitive knowledge were used by 17 participants in the dimension of applying in LOTS.

Decoded Factors for Higher-Order Thinking Skills in Online Learning

According to the results of the DQICA, the factors for HOTS were attributed to the specified dimensions of analyzing, evaluating, and creating in the revised taxonomy constructed with the identified codes, categories, and themes. The overall findings for the HOTS are displayed in Table 4.

Table 4.
DQICA Results for HOTS

Higher-Order Thinking Skills				
Bloom's Revised Taxonomy		Codes for Analyzing	Codes for Evaluating	Codes for Creating
Themes	Categories			
Factors for Abilities	Strengths in Instructional Design	-Assignments -Content-rich course -Concrete examples -Interaction	-Lesson plan and time -Interaction -Content-rich materials	-Assignments -Interaction -Content-rich materials
	Descriptive Actions	-Comparing -Outlining -Deconstructing -Inferring	-Reviewing -Supporting -Judging	-Designing -Constructing -Inventing
	Individual Circumstances	-Provided that I internalized	-Interested -Self-evaluation -Thanks to prior knowledge -Provided that I internalized	-Interested -Provided that I internalized
Factors for Inabilities	Problems in Instructional Design	-Instructor-based reasons -Outdated instructional methods and techniques	-Problems with lesson plans and time management -Lack of interaction	-Problems with lesson plans and time management -Instructor-based reasons -Outdated instructional methods and techniques -Out of target
	External Factors	N/A	-Technical problems	N/A
	Individual Circumstances	-Uninterested -Not applicable to life	-Lack of readiness -A personnel process -Need for expertise	-Uninterested -Fail to understand -Lack of motivation
Expectations	Interactive Learning Environment	-Effective participation	-Effective participation -Various instructional methods and strategies	-Effective participation -Various instructional methods and strategies -A motivating instructor
	Instructional Design	-Concrete examples -Project assignments -Guiding materials to analyze -Detailed instruction -Readiness assessments	-Course content -Concrete examples - Well-rounded evaluation	-Course content -Concrete examples -Well-rounded evaluation

N/A: Not Applicable

HOTS depended on instructional design and individual circumstances. They were unachievable because of some external factors and individual circumstances, and when there were problems in instructional design. The participants expected an interactive learning environment and appropriate instructional design to acquire HOTS. The codes identified for analyzing, evaluating, and creating are clarified below.

Analyzing Information in Online Learning

The participants stated that they could analyze what they learned in the online lesson with assignments, rich content, concrete examples, and interaction. As for personal factors, they could acquire analyzing skills provided they could internalize them. The skills they frequently used in the analysis process were comparing, outlining, deconstructing, and inferring. For example, a participant stated what she had found regarding analyzing in an effectively designed online course.

> *P6: "In the effectively designed online course, we had the opportunity to examine and analyze examples from different fields, and we were able to discuss our views as a result of this analysis. As I mentioned previously, giving materials from various scopes or as assignments after the course allows us to analyze from a broad perspective". (Theme: Factors for Abilities; Category: Strengths in instructional design; Code: Content-rich course / Assignments)*

However, they could not analyze because of instructor-based reasons, outdated instructional methods, and techniques. Also, if they were uninterested in the course content and it did not apply to life, they could not analyze it. For instance, a participant stated that analysis would not be possible without providing enough examples and feedback.

> *P18: "Most of the time, online courses can be a lecture environment where just lecturing. That's a hindrance. Unless enough examples and feedback are provided, I cannot analyze the issue". (Theme: Factors for Inabilities; Category: Problems in instructional design; Code: Outdated instructional methods and techniques)*

Regarding their expectations from a course offering more opportunities for analyzing skills, they expected effective communication, effective participation, concrete examples, project assignments, guiding materials for analysis, detailed instruction, and readiness assessments. To exemplify, a participant highlighted the importance of focusing and effective participation for analysis as follows:

> *P14: "It can be [possible] thanks to activities that increase understanding. Analyzing requires understanding first, and that is possible with attention. Activities that increase attention should be [included] in the lesson. I think the most crucial problem of distance education is focusing. If this is possible, we can analyze the information. Besides, in the application, the student should actively participate in the lesson, and the interaction should be available. When there is an application, we can internalize and transfer the knowledge into practice and not forget". (Theme: Expectations; Category: Interactive learning environment; Code: Effective participation)*

Evaluating Information in Online Learning

According to the participants' statements, evaluation of information could be possible through appropriate lesson plans and time management, interaction, and content-rich materials used during the lesson. According to their individual circumstances, participants could evaluate their learnings via self-evaluation, thanks to their prior knowledge and if they were interested and internalized the content. Notably, they mostly used reviewing, supporting, and judging. For example, a participant expressed his individual circumstance and his self-evaluation process as follows:

> *P14: "I don't think this is just a matter of distance education. Even in distance education, anyone who wants to receive and use information can access this information and apply it in life and evaluate it. I think this is a self-situation". (Theme: Factors for Abilities; Category: Individual circumstances; Code: Self-evaluation)*

The reasons for the inability to evaluate were problems in the lesson plan and time, technical issues, and lack of interaction. The post-graduate students stated that the evaluation process was very personal. It required experience, and it was not possible if they were not ready. A direct quote from a participant who attributed the inability to evaluate to the lack of interaction in terms of instructional design is as follows:

> *P10: "I don't, cannot evaluate if I don't adopt the subject, and the flow of the course, and do not feel close to the instructors' attitude. If the instructor gives me this opportunity and I do not encounter a harsh reaction when I explain my opinion, I have the courage to evaluate it, but there were times I could not evaluate because I felt hesitant and scared". (Theme: Factors for Inabilities; Category: Instructional design; Code: Lack of interaction)*

The participants' expectations were identified as effective participation, various instructional methods,

and strategies, required course content, well-rounded evaluation, and concrete examples. The views of a participant who stated her expectations from online classes as well-rounded evaluations as follows:

> *P19: "Utilizing various techniques, such as peer assessment or self-assessment is valuable. Thus, better analysis and evaluation would be possible by reaching a piece of information by criticizing". (Theme: Expectations; Category: Instructional design; Code: Well-rounded evaluation)*

Creating Information in Online Learning

The participants stated that it was possible to develop brand-new products or ideas using the information they learned in the online course, thanks to assignments, interaction, and content-rich materials. They also indicated that they could create new ideas or products if they were interested in the subject and internalized them. The skills they used for creation were designing, constructing, and inventing. As for a participant's insight, the skill of creation is influenced by personal situations and attitudes, including perceptions, interests, and skills.

> *P13: "In these last steps, not solely the lesson but also the personal situations and attitudes are in the foreground. Perceptions, interests, and skills... rarely I could contemplate new changes or regulate things in my own school with what I learned in the course. For example, with the examples of strategic management plans shared in the strategic management course, I thought about how I could do the best for my school". (Theme: Factors for Abilities; Category: Individual circumstances; Code: Interested / Provided that I internalized)*

According to another participant, a course emphasizing creation skills should be of sufficient length and taught by an instructor with a strong command of the subject. It should also allow ample time for analysis through examples.

> *P14: "The course length should be sufficient, the lecturer should have a good command of the subjects, and there should be time to analyze through examples. In this case, it is also crucial to apply. Thanks to this application, new products may emerge. Evaluation of the products will also provide a separate development and would be supportive and encouraging. In-class interaction should always be possible. The class could discuss the things to be done in the light of the evaluations". (Theme: Factors for Abilities; Category: Expectations; Code: Instructional design / Interactive learning environment)*

The post-graduate students also mentioned that they could not create because of instructor-based reasons, problems in lesson plans and time management, and outdated instructional methods and techniques. The fact that they were uninterested in the subject, failed to understand, and a lack of motivation harmed this situation. A sample quote of a participant highlighting the cruciality of suitable course content and opportunities for creation in a course design is as follows:

> *P4: "In online education, the lessons are mostly limited to the theoretical lecture part and do not include the redesign or creation process. In the content of our courses, we do not find many opportunities for them. Maybe these areas can be more prevalent in a different course. The course content and design should be suitable for this. I think we could not find many opportunities for this". (Theme: Factors for Inabilities; Category: Problems in instructional design; Code: Out of target)*

Finally, the coded descriptive actions for HOTS were evaluated based on knowledge types (Anderson & Krathwohl, 2001). The results of the evaluation are presented in Table 5. Accordingly, all the knowledge types were used by 15 participants in the dimension of analyzing while three types of knowledge were stated by 15 participants in the dimension of evaluating except factual knowledge. Only two types of knowledge; namely, procedural, and metacognitive knowledge were used by 11 participants in the dimension of creating in HOTS.

Table 5.
Coded Descriptive Actions of HOTS Processing in the Knowledge Domain

Bloom's Revised Taxonomy		Knowledge Types				n	Participants (N=20)
		Factual Knowledge (What is required to do the task)	Conceptual Knowledge (Ideas, principles, theories, behaviors)	Procedural Knowledge (The skills and techniques of doing the task)	Metacognitive Knowledge (Self-awareness, using experiences, cognition)		
HOTS	Analyzing	-Outlining	-Comparing	-Inferring	-Deconstructing	15	P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P12, P13, P16, P17, P18
	Evaluating	N/A	-Reviewing	-Supporting	-Judging	15	P3, P4, P5, P6, P7, P8, P9, P10, P12, P13, P14, P16, P17, P18, P19
	Creating	N/A	N/A	-Designing -Constructing	-Inventing	11	P5, P7, P8, P9, P10, P12, P13, P14, P16, P17, P18

N/A: Not Applicable

DISCUSSION

From the cognitive perspectives of Bloom's revised taxonomy, it is pertinent to reevaluate student online learning experiences. Therefore, this study aimed to qualitatively identify the factors affecting post-graduate students' LOTS and HOTS indicated in Bloom's revised taxonomy designed for the cognitive domain during online learning. The results of this study pointed to the elements that affect both LOTS (remembering, understanding, and applying) and HOTS (analyzing, evaluating, and creating) in online learning environments.

LOTS necessitate applying knowledge to familiar situations and contexts or making a simpler call for information; tasks related to LOTS may be problems that can be solved by mechanically applying techniques that the learner is already familiar with from prior instruction, practice, or a combination of both, but which they may not fully understand (Zoller & Tsaparlis, 1997). LOTS are the basis for developing HOTS (Hopper, 2009). In Bloom's revised taxonomy, four types of knowledge; namely, factual, conceptual, procedural, and metacognitive knowledge were included for LOTS, which makes the placement of learning objectives more practical (Wilson, 2016).

Regarding the findings for LOTS, the participants emphasized that the skill of remembering was facilitated in online courses by strengths in instructional design and management, such as assignments, content-rich materials, course content, interaction, and concrete examples. However, it was revealed that difficulties in remembering were associated with factors such as course content, limited interaction, limited lesson time, technical problems, and various distractors. Therefore, it was detected that the participants expressed a need for various instructional methods, management strategies, effective participation, instructor guidance, and clear lesson plans to enhance their remembering skills. Consistently, Singh et al. (2021) pointed out that carefully planned online education is a complex process, and teachers must carefully plan, design instructional strategies, and incorporate elements of online educational pedagogies to create an engaging learning environment and encourage engagement and interaction during the class.

The results for the skill of understanding indicated that the participants reported that assignments,

content-rich materials, course content, and interaction contributed to their comprehension of the subjects in online courses. Personal interest in a topic was also found to be a factor that affected participants' ability to understand what they learned. When learners have a genuine interest in a subject, it positively impacts their motivation and engagement, leading to better comprehension (D'Angelo, 2018). Nevertheless, it was deduced that challenges in understanding were linked to course content, limited interaction, and technical problems. Regarding their expectations of understanding information, it was identified that the participants emphasized the importance of various instructional methods, classroom management strategies, as well as content-rich materials, to enhance their understanding in online classes. These elements provide a supportive learning environment that facilitates understanding, which is consistent with the research conducted by Barari et al. (2022). On the other hand, Tibi (2018), pointed out that the structured discussion forums in fully online courses could enhance students' motivation in learning, which was not found as a factor affecting understanding in online learning in this study.

In terms of applying information, it was detected that the participants highlighted the significance of interaction, concrete examples, and assignments in facilitating application in online courses. Personal interest in a subject was also identified as a factor that influenced participants' ability to apply what they learned. On the other hand, limitations in the course, such as a lack of concrete examples, limited interaction, limited materials, and limited lesson time, were reported as barriers to applying information in online classes. Individual circumstances, such as a busy timetable and finding the course content irrelevant or boring, also impacted the application of learned concepts. As for the expectations of the participants for the development of applying information, it was reported that the participants required effective communication and interaction in addition to more application examples, content-rich materials, and project assignments in online classes. Consistently, Hmelo-Silver et al. (2007) also highlighted the significance of engagement and real-world application in enhancing knowledge application. The current study revealed the importance of interaction, engagement, and practical examples in applying information whereas Salarvand et al. (2023) brought particular concerns of communication and cooperation to the forefront.

HOTS were traditionally associated with problem-solving and critical thinking (Lewis & Smith, 1993); and they have recently been appertaining to metacognition which is the process of reflecting on one's own thinking (Schraw et al., 2011). In other words, HOTS, which are beyond LOTS, comprise unfamiliar settings and the need to conceptually understand complex topics within academic subjects (Jansen & Möller, 2022). In Bloom's revised taxonomy, four types of knowledge make the placement of learning objectives and outcomes more practical for HOTS (Wilson, 2016). By incorporating metacognitive aspects, HOTS also emphasize the importance of self-awareness and self-regulation in the thinking process. Learners with well-developed metacognitive skills are able to monitor their own thinking, evaluate their progress, and make adjustments to their strategies as needed.

In line with the findings for HOTS, it was detected that the participants identified strengths in instructional design, including assignments, content-rich materials, concrete examples, and interaction, as the factors that supported analyzing information in online learning. These factors align with the literature emphasizing the importance of providing learners with meaningful and engaging learning experiences to enhance their analytical thinking (Mayer, 2019; Sweller et al., 2019). However, it was revealed that the problems deriving from instructor-based reasons and outdated instructional methods and techniques hindered the participants' analyzing in online classes, which consistently aligns with previous research highlighting the role of effective teaching practices and up-to-date instructional approaches in fostering HOTS (Darabi et al., 2011; Prince, 2004). To facilitate the development of analyzing information, the participants expected an online learning setting encouraging active participation and including concrete examples, project assignments, and guiding materials to analyze with detailed instruction and readiness assessments. These expectations are in line with the literature on effective instructional and classroom management strategies for fostering HOTS, offering authentic tasks, including real-world examples, and encouraging active engagement (Hmelo-Silver et al., 2007; Jonassen, 2010).

As for the skill of evaluating information, it was reported that the participants emphasized strengths in instructional design and classroom management strategies in online courses such as interaction, content-rich materials, lesson plans, and time. As Raja and Nagasubramani (2018) claimed that teachers raised concerns about students' lack of concentration during online lessons, opportunities for interaction and collaboration should be offered in online courses (Choy & Quek, 2016; Vlachopoulos & Makri, 2019) by redesigning the materials, digital tools, and lesson plan (Dhawan, 2020). On the other hand, the participants pointed out the factors hindering the evaluation of information as problems with lesson design, interaction, technical problems, readiness, and expertise. Barrot et al. (2021) detected consistently similar challenges students experienced during online classes addressing the issues related to instructional design, technical infrastructure, and learners' readiness for evaluation. To support the skill of evaluating information, the participants highlighted their expectations in online learning as effective strategies for interaction, use of various instructional methods and strategies in addition to the improvement of course content with concrete examples and well-rounded evaluation. These expectations are consistent with the literature focusing on the value of using a variety of assessment techniques, providing opportunities for peer interaction and feedback, and matching course content to learning objectives (Garrison & Vaughan, 2008; Palloff & Pratt, 2007; Vlachopoulos & Makri, 2019).

Regarding the skill of creating information, strengths in instructional design and classroom management were reported as assignments, interaction, and content-rich materials, which is consistent with the existing literature (Jansen & Möller, 2022; Vlachopoulos & Makri, 2019). Nevertheless, the challenges in the creation of information were identified as problems with lesson plans and time management, instructor-based issues, outdated instructional methods and techniques in addition to technical problems similarly corresponding to the literature (Barrot et al., 2021; Kebritchi et al., 2017; Picciano, 2009). Therefore, to enhance their skill of creating information taught in online courses, the participants expressed their need for effective participation, various instructional methods and strategies as well as motivation in addition to course content with concrete examples. Contrary to the claim that the structured design and management of online learning environments are significant in fostering HOTS in higher education, some studies suggest that the intrinsic motivation and self-regulation of students play a more crucial role (Kebritchi et al., 2017; Song et al., 2016). In this respect, hetagogy, also known as "self-determined learning", emphasizes the learner's role and impact in their education, and this learning model shifts the responsibility of learning to the learner, highlighting their ability to make independent decisions and self-regulate (Blaschke & Hase, 2016). Similarly, Kebritchi et al. (2017) emphasized that learners must be primarily self-motivated and self-directed in online courses by stating that online instructors should be prepared to assist students struggling to learn in higher education.

Overall, the findings suggest that the design and management of online learning environments play a crucial role in facilitating both LOTS and HOTS in higher education. By incorporating instructional and classroom management strategies that promote interaction, communication, participation, and collaboration, provide concrete examples including a variety of cognitive levels, and offer meaningful assignments in line with the complexity of topics, educators can enhance students' learning experiences and support their cognitive development.

Implications and Recommendations

This study revealed some significant factors affecting post-graduate students' LOTS and HOTS indicated in Bloom's revised taxonomy designed for the cognitive domain during online learning. Accordingly, online learning processes in higher education should be reevaluated in terms of teaching, learning, assessment, and administration. Therefore, some practical implications should be considered from the perspectives of students, instructors, practitioners, educational specialists, and faculty administrators.

Online learning environments and classroom management strategies should be designed so that active engagement is promoted, effective interaction is encouraged with collaboration, meaningful assignments are planned to foster LOTS and HOTS, and various instructional methods and strategies

are appropriately developed aligning with pedagogical aspects of learning and teaching. Particularly, post-graduate students studying in the field of education should develop their HOTS to meet the professional requirements of becoming a teacher through evaluating, reasoning, problem-solving, and creating new information. The adoption of Bloom's revised taxonomy into the online learning process in higher education facilitates the cognitive development of students taking online courses (Sarkar, 2023). Therefore, to support the effectiveness of online learning environments, instructors and practitioners should be equipped with the necessary pedagogical proficiencies tailored to the demands of online learning settings. These pedagogical proficiency skills can be excelled in instructional design, technology integration, student engagement, communication, time management, organization, adaptability in teaching strategies, and flexibility in modifying course content and delivery methods within the scope of Bloom's revised taxonomy.

By addressing the challenges and paying attention to factors revealed in this study and incorporating the recommendations, educators could enhance students' learning experiences, support their cognitive development, and foster the development of both LOTS and HOTS in online higher education. Moreover, to successfully meet the professional requirements for becoming a teacher and working as a teacher, higher-order cognitive processing skills must be developed such as the ability to evaluate, reason, solve problems, and learn and apply complicated ideas (Haataja et al., 2023; Metsäpelto et al., 2022). Therefore, faculty administrators should consider online learning environments based on Bloom's revised taxonomy to provide the necessary staff development opportunities to instructors and practitioners to improve the courses conducted in these environments and make them more efficient.

Limitations and Further Research

There are several limitations of this research deriving from its adopted methodological approach. The findings of this research are based on the remarks of post-graduate students only. Different groups of learners may have unique characteristics and experiences that could influence their perceptions and needs regarding LOTS and HOTS in online learning. Moreover, the research utilized a qualitative approach to analyze the self-reflections of post-graduate students. While qualitative analysis provides rich insights and in-depth understanding, it may limit the ability to make quantitative comparisons or draw statistical conclusions. The findings might be subjective and influenced by the researchers' interpretations. In addition, the data collected in this research relies on the participants' self-reports and perceptions of their own learning experiences which are subject to biases, which may affect the accuracy and reliability of the findings. Finally, the research focused solely on the perspectives of post-graduate students, potentially overlooking the viewpoints of other stakeholders in online learning, such as instructors, practitioners, or administrators. Including multiple perspectives could provide a more comprehensive understanding of the factors influencing LOTS and HOTS in online education.

For further insights, conducting quantitative studies can complement the qualitative findings by examining the prevalence and significance of the identified factors affecting LOTS and HOTS in online learning. Large-scale surveys or experimental designs could provide statistical evidence and allow for comparative analyses on diverse learner populations from different cultural and educational backgrounds, which can provide a broader understanding of the factors influencing LOTS and HOTS in online education.

CONCLUSION

This study extends the understanding of the factors influencing both LOTS and HOTS in online learning environments for post-graduate students by bringing a new perspective to Bloom's revised taxonomy in online higher education. The results of the present study contribute to the existing literature by providing insights from the remarks of post-graduate students specialized in educational sciences, determining the factors affecting the cognitive and knowledge domains of Bloom's revised taxonomy, and

recommending specified implications to be considered during online learning in higher education. Accordingly, the importance of instructional design and classroom management elements such as assignments, content-rich materials, interaction, and concrete examples was identified in supporting LOTS and HOTS. Moreover, the challenges in online learning environments at the post-graduate level were identified such as limited interaction, technical problems, and outdated instructional methods that hinder the development of thinking skills in online courses. By addressing the above-mentioned limitations and future directions, educators and administrators could enhance online learning environments, promote the development of thinking skills, and improve the overall quality of online higher education.

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APPENDICES

Appendix 1: DQICA Results for Themes, Categories and Codes with Frequencies

Main Themes (*f*)*	Themes (*f*)	Categories (*f*)	Codes (*f*)
Remembering (291)	Factors for Abilities (119)	Strengths in Instructional Design (65)	Assignments (2) Content-rich materials (13) Course content (4) Interaction (39) Concrete examples (7)
		Descriptive Actions (31)	Recognizing (14) Listing (3) Identifying (6) Finding (5) Matching (3)
		Individual Circumstances (23)	Interested (9) Rehearsal opportunity (13) Motivated (1)
	Factors for Inabilities (106)	Problems in Instructional Design (89)	Course content (27) Limited interaction (47) Limited lesson time (15)
		External Factors (16)	Technical problems (9) Various distractors (7)
		Individual Circumstances (2)	Not applicable to life (2)
	Expectations (64)	Interactive Learning Environment (62)	Various instructional methods and strategies (36) Effective participation (26)
		Instructional Design (2)	Instructor guidance (1) Lesson plan (1)
Understanding (179)	Factors for Abilities (92)	Strengths in Instructional Design (59)	Assignments (5) Content-rich materials (17) Course content (3) Interaction (34)
		Descriptive Actions (26)	Interpreting (7) Summarizing (5) Inferring (2) Paraphrasing (4) Explaining (8)
		Individual Circumstances (3)	Interested (3)
	Factors for Inabilities (48)	Problems in Instructional Design (37)	Course content (5) Limited interaction (32)
		External Factors (8)	Technical problems (8)
		Individual Circumstances (3)	Uninterested (3)
	Expectations (39)	Interactive Learning Environment (22)	Various instructional methods and strategies (20) Turning the camera on (2)
		Instructional Design (17)	Content-rich materials (10) Project assignments (1) Course content (6)
Applying (163)	Factors for Abilities (75)	Strengths in Instructional Design (32)	Interaction (16) Concrete examples (11) Assignments (5)
		Descriptive Actions (28)	Carrying out (12) Using (9) Implementing (7)
		Individual Circumstances (15)	Interested (15)

Appendix 1: DQICA Results for Themes, Categories and Codes with Frequencies *(Continued)*

Main Themes (*f*)*	Themes (*f*)	Categories (*f*)	Codes (*f*)
Applying (163) *(Continued)*	Factors for Inabilities (50)	Problems in Instructional Design (23)	No concrete examples (4) Limited interaction (13) Limited materials (2) Limited lesson time (4)
		External Factors (3)	N/A**
		Individual Circumstances (24)	Fail to understand (6) Busy timetable (5) Boring atmosphere (1) Not applicable to life (12)
	Expectations (38)	Interactive Learning Environment (20)	Effective communication (4) Effective participation (16)
		Instructional Design (18)	More application examples (6) Content-rich materials (4) Project assignments (8)
Analyzing (149)	Factors for Abilities (79)	Strengths in Instructional Design (42)	Assignments (3) Content-rich course (2) Concrete examples (7) Interaction (29)
		Descriptive Actions (29)	Comparing (10) Outlining (11) Deconstructing (4) Inferring (4)
		Individual Circumstances (8)	Provided that I internalized (8)
	Factors for Inabilities (36)	Problems in Instructional Design (29)	Instructor based reasons (11) Out-dated instructional methods and techniques (18)
		External Factors (5)	N/A
		Individual Circumstances (2)	Uninterested (1) Not applicable to life (1)
	Expectations (34)	Interactive Learning Environment (16)	Effective participation (16)
		Instructional Design (18)	Concrete examples (7) Project assignments (3) Guiding materials to analyze (3) Detailed instruction (4) Readiness assessment test (1)
Evaluating (127)	Factors for Abilities (54)	Strengths in Instructional Design (25)	Lesson plan and time (3) Interaction (19) Content-rich materials (3)
		Descriptive Actions (22)	Reviewing (12) Supporting (6) Judging (4)
		Individual Circumstances (7)	Interested (2) Self-evaluation (3) Thanks to prior knowledge (1) Provided that I internalized (1)
	Factors for Inabilities (36)	Problems in Instructional Design (19)	Problems in lesson plan and time (4) Lack of interaction (15)
		External Factors (4)	Technical problems (4)
		Individual Circumstances (13)	Lack of readiness (1) A personnel process (5) Need for expertise (7)
	Expectations (37)	Interactive Learning Environment (20)	Effective participation (10) Various instructional methods and strategies (10)

Appendix 1: DQICA Results for Themes, Categories and Codes with Frequencies *(Continued)*

Main Themes (*f*)*	Themes (*f*)	Categories (*f*)	Codes (*f*)
Evaluating (127) *(Continued)*	Expectations (37) *(Continued)*	Instructional Design (17)	Course content (1) Well-rounded evaluation (13) Concrete examples (3)
Creating (154)	Factors for Abilities (45)	Strengths in Instructional Design (11)	Assignments (2) Interaction (7) Content-rich materials (2)
		Descriptive Actions (24)	Designing (13) Constructing (9) Inventing (2)
		Individual Circumstances (10)	Interested (4) Provided that I internalized (6)
	Factors for Inabilities (62)	Problems in Instructional Design (46)	Problems in lesson plan and time (16) Instructor based reasons (3) Out-dated instructional methods and techniques (6) Out of target (21)
		External Factors (3)	N/A
		Individual Circumstances (13)	Uninterested (4) Fail to understand (7) Lack of motivation (2)
	Expectations (47)	Interactive Learning Environment (24)	Effective participation (7) Various instructional methods and strategies (14) Motivating instructor (3)
		Instructional Design (23)	Course content (10) Concrete examples (11) Well-rounded evaluation (2)

*Frequency of coded segments; ** N/A: Not Applicable

TÜRKÇE GENİŞLETİLMİŞ ÖZET

Günümüzde, özellikle pandemi sonrası dönemde, öğrenme süreçlerinin dijitalleşmesi eğitimde çevrimiçi öğrenmenin nasıl gerçekleştiği konusundaki araştırmaları yoğunlaştırmaktadır. Eğitim bilimlerinde yaygın olarak kullanılan Bloom'un öğrenme taksonomisi, öğrenmeyi bilişsel, duyuşsal ve psikomotor alanlarda incelemektedir. Bilişsel alan; analiz, sentez ve değerlendirme gibi üst düzey düşünme becerilerine odaklanmakta ve özellikle yükseköğretim seviyesinde üst düzey bilgi aktarımı açısından ayrıca önem kazanmaktadır. Anderson ve Krathwohl (2001), 2000'lerde Bloom'un taksonomisinin bilişsel boyutunu yeniden ele almış, düzeyleri hatırlama, anlama, uygulama, analiz etme, değerlendirme ve yaratma şeklinde isimlendirmiş ve ek olarak olgusal, kavramsal, işlemsel ve üstbilişsel bilgi içeren bir bilgi alanı da yapılandırmıştır. Bu yenilenmiş haliyle, Bloom taksonomisi, özellikle geleneksel yüz yüze ortamlarda öğrenme çıktılarını değerlendirme açısından eğitimcilere kullanışlı bir çerçeve sunmaktadır.

Eğitimde çevrimiçi ve karma (hibrit) öğrenme ortamlarının yaygın hale gelmesiyle, Bloom'un yenilenmiş bilişsel taksonomisinin dijital öğrenme süreçlerine nasıl uyarlandığını ve uygulandığını araştırmak gerekliliği ortaya çıkmıştır. Fiziksel mesafe, anında ve doğrudan cevap alamamak ve çevrimiçi öğrenmede değerlendirme kısıtlamaları gibi zorluklar, bu çevrimiçi öğrenmeyi bilişsel bakış açısıyla ele alarak incelemenin önemini artırmaktadır. Önceki araştırmalar (Abuhassna vd., 2020; Alaghbary, 2021), Bloom'un taksonomi düzeyleri ile çevrimiçi ortamlarda akademik başarı arasında ilişkiler olduğunu göstermiştir. Bununla birlikte, özellikle lisansüstü eğitim düzeyinde, Bloom'un yenilenmiş taksonomisi kullanılarak çevrimiçi öğrenmeyi nitel açıdan değerlendiren çalışmaların kısıtlı olduğu görülmektedir. Bu nedenle, bu çalışma, eğitim bilimleri alanındaki lisansüstü öğrencilerinin çevrimiçi öğrenmeyi etkileyen faktörlere dair bakış açılarını Bloom'un bilişsel taksonomisini kullanarak nitel olarak ortaya koymayı amaçlamaktadır. Bu doğrultuda, bu çalışma ile Bloom'un yenilenmiş taksonomisi kullanılarak bilişsel alan için belirlenmiş olan alt düzey düşünme becerileri (ADDB) olan hatırlama, anlama ve uygulama ile üst düzey düşünme becerileri (ÜDDB) olan analiz etme, değerlendirme ve yaratma süreçlerini etkileyen faktörleri incelemek hedeflenmektedir.

Bu çalışma, eğitim bilimleri alanındaki lisansüstü öğrencilerinin çevrimiçi öğrenme konusundaki bilişsel bakış açılarını keşfetmek için temel nitel desende yürütülmüştür. Çalışmanın katılımcıları, olasılığa dayanmayan örnekleme tekniklerinden amaca yönelik ölçüt örnekleme yöntemi ve kartopu örnekleme yöntemi (Yıldırım ve Şimşek, 2021) ile belirlenmiş ve toplam 20 katılımcı araştırmaya dahil olmuştur. Bu doğrultuda, çalışmanın katılımcıları için ölçüt, Türkiye'de eğitim bilimleri alanında en az bir çevrimiçi ders almış lisansüstü öğrencisi olmaktır. Katılımcıların hepsi, Bloom'un yenilenmiş taksonomisini kullanarak öğrenme süreçlerini yansıtabilecek ve yorumlayabilecek düzeyde yeterli bilgi ve deneyime sahiptir.

Veri toplama aracı olarak kullanılan yarı-yapılandırılmış görüşme formu demografik bilgileri ve Bloom'un yenilenmiş taksonomisine dayanan soruları içeren iki bölümden oluşmaktadır. Görüşme soruları, lisansüstü öğrencilerinin çevrimiçi öğrenme süreçlerini hem ADDB hem de ÜDDB'lere göre Bloom'un yenilenmiş taksonomisi çerçevesinde nasıl anlamlandırdıklarını ve bu doğrultuda çevrimiçi öğrenme süreçlerini etkileyen faktörleri ortaya koymaya yönelik olarak tasarlanmıştır. Görüşme sorularının oluşturulmasında uzman görüşlerinden ve pilot uygulamadan yararlanılmıştır. Bütün görüşmeler, çevrimiçi olarak gerçekleştirilmiş ve her biri yaklaşık 25-30 dakika sürmüştür. Veri toplama sürecinden önce gerekli etik kurul izni alınmış, katılımcılara bilgilendirilmiş onam formu sunulmuş, görüşmeler boyunca ve raporlama aşamasında etik hususlara dikkat edilmiştir.

Veri analizi, Bloom'un teorik çerçevesini takip eden yönlendirilmiş bir yaklaşımla nitel içerik analizi kullanılarak gerçekleştirilmiştir. Yönlendirilmiş nitel içerik analizi (YNİA) (directed qualitative content analysis [DQICA]) olarak adlandırılan bu yöntem, verileri kodlamayı ve kategorilere ayırmayı içermekte olup Bloom'un yenilenmiş taksonomisine uygun şekilde, hatırlama, anlama, uygulama, analiz etme, değerlendirme ve yaratma ana temaları çerçevesinde yürütülmüştür. YNİA, verileri titiz ve

sistemli bir şekilde analiz etmek için kullanılan güçlü bir araştırma yöntemidir ve analiz başlamadan önce geliştirilen teorik bir çerçeveye veya önceden belirlenmiş bir kategori setine dayanmaktadır (Assarroudi vd., 2018). Bu analiz ile lisansüstü öğrencilerin çevrimiçi ortamlarda öğrenme deneyimlerini etkileyen faktörleri ortaya çıkarmak ve eğitim bilimleri alanında çevrimiçi eğitime katkı sağlamak amaçlanmıştır. YNİA'dan elde edilen bulgular, ADDB ve ÜDDB'ler ile uyumlu şekilde katılımcılar açısından (1) yeterliklere ilişkin faktörler, (2) yetersizliklere ilişkin faktörler ve (3) beklentiler olmak üzere üç ana tema altında ortaya konulmuştur.

Araştırma sonucunda elde edilen bulgulara göre, Bloom'un yenilenmiş taksonomisinin bilişsel yönlerine derinlemesine odaklanılarak, lisansüstü öğrencilerin çevrimiçi öğrenme ortamlarındaki ADDB ile ÜDDB'lerini etkileyen faktörler ortaya konulmaya çalışılmıştır. Bu doğrultuda hatırlama, anlama ve uygulama bilgilerini içeren ADDB'lerin, ödevler, içerik açısından zengin materyaller ve etkileşim gibi öğretim tasarımındaki ve sınıf yönetimindeki güçlü faktörler tarafından olumlu etkilendiği bulgusuna ulaşılmıştır. Ancak, sınırlı etkileşim ve teknik sorunlar gibi zorlukların, katılımcıların yeterli düzeyde hatırlama ve anlamasını engellediği ortaya çıkmıştır. ADDB'leri geliştirmek için katılımcılar, çeşitli öğretim yöntemlerine, etkili katılıma, öğretim elemanı rehberliğine ve daha açık, düzenli ders planı ve izlencelerine ihtiyaç duyduklarını ifade etmiştir.

Öte yandan, araştırma bulgularına göre, analiz etme, değerlendirme ve yaratma gibi becerileri içeren ÜDDB'lerin, zengin öğretim tasarımı ve sınıf yönetimi becerileri ile desteklendiği; klasik teknikler kullanıldığında ve öğretim elemanından kaynaklı sorunlar olduğunda ise ÜDDB'lerinin gelişiminin engellendiği ortaya çıkmıştır. Katılımcılar, analitik ve değerlendirme becerilerine yönelik düşüncelerini geliştirmek için aktif katılım, somut ve hayata dönük örnekler, proje ödevleri ve yönlendirici materyallerin önemini vurgulamıştır. Bilgiyi değerlendirme ve yaratma ile ilgili yetersizliklere yönelik faktörler ise, ders tasarımı, etkileşim, teknik sorunlar ve hazır bulunuşlukla ilgili sorunlar olarak ortaya çıkmıştır. Katılımcılar, çevrimiçi öğrenme ortamlarında bu becerileri güçlendirebilmeleri için etkili etkileşim, çeşitli öğretim yöntemleri, zengin ders içeriği ve çok yönlü değerlendirme gibi beklentileri olduğunu belirtmiştir.

Sonuç olarak, elde edilen bulgular, yükseköğretim düzeyinde çevrimiçi öğrenme ortamlarında hem ADDB hem de ÜDDB'lerin geliştirilebilmesi açısından çevrimiçi öğretim tasarımının ve sınıf yönetim becerilerinin kritik önemini vurgulamaktadır. Bu bağlamda, aktif katılım, etkili iletişim, etkileşim ve işbirliğinin teşvik edilmesi, uygun ödevlerin ve görevlerin planlanması ve çeşitli öğretim yöntemlerinin geliştirilmesi önerilmektedir. Çevrimiçi öğrenme süreçlerinin Bloom'un yenilenmiş taksonomisi çerçevesinde ele alınarak incelenmesi, öğrencilerin bilişsel gelişimine önemli ölçüde katkı sağlayabilir. Çalışmadan elde edilen bulgu ve önerilere dayanarak eğitimcilerin, uygulayıcıların ve eğitim yöneticilerinin çevrimiçi öğrenme ortamlarını değerlendirmeleri ve geliştirmeleri önerilmekte, böylece yükseköğretim düzeyinde öğrencilerin öğrenme deneyimlerine ve bilişsel gelişimlerine katkı sağlanabileceği düşünülmektedir.