

## Interaction in Distance Education: Meta-Synthesis of Qualitative Studies

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### Abstract

In distance education processes, interaction has a very important place in the learner's academic performance, attitude and motivation, participation in the lesson, and the acquisition of instructional goals and behaviors. The aims of this study, in which the interaction in synchronous and asynchronous distance education processes is investigated by the meta-synthesis method, are as follows: In synchronous and asynchronous distance education processes, for what purposes are the interactions established, through which features and functions can interactions be increased in distance education and what factors adversely affect this process when interactions are established?. According to these purposes, interaction in distance education is established for cognitive, affective, and cooperative purposes. Cognitive-oriented interaction is included question-answer, asking for and expressing opinions, giving feedback, making explanations, sharing information and experience, participating in discussions, and suggesting solutions and guidance. Affectively focused interaction, encouragement, and support, sharing of personal information show solidarity toward group members and provide emotional support. Collaborative interaction is determined by group qualifications (members and workspace), coordination among group members, distribution of tasks within the group (expertise), and group work processes. The categories that determine how the interaction frequency increase are: learner-teacher, learner-learner, learner-content, and multiple interactions. The most common in these categories are teaching strategies that encourage peer-to-peer counseling, course contents with detailed and explanatory demonstrations, the learner's feeling as being a part of a group, reducing social and psychological distance with a quick reply to the learner's e-mail, in-depth explanatory feedback on learner questions and comments, and using alternative web resources. Among the factors that negatively affect the interaction process are pedagogical inadequacy that negatively affects the cooperation between learners, negative experiences, slow connection or disconnection, conflicts between learners, insufficient time in an online class to interact due to the intensity of the content, and the dominant learner being at the forefront when the teacher can't manage the interaction process.

**Keywords:** Distance education, distance learning, interaction.

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## Introduction

Interaction has a very important place in educational environments. At the same time, interaction is at a central point in the learning process (Sims, 1997). While physical proximity in face-to-face education allows for easier interaction, interaction in distance education can be more demanding than in face-to-face education. Moore (1980) states that the physical distance between the learner and the teacher will create both a communicative and a psychological deficiency. With some changes to be made in the behavior patterns of the learner-teacher, the dialogues, and the design (structure) of the lesson; This deficiency due to the interactional (operational) distance can be eliminated (Horzum, 2010). On the other hand, physical proximity is not very important for digital and virtual societies that are steadily increasing and developing due to the development of network technologies (Turkle, 1995).

Although not explicitly stated in many of the definitions of distance education, it is emphasized that interaction is an integral component (Bernard et al. 2009). USA Distance Education Association defines distance education as “learning activities in which interaction takes an important place in educational environments that provide K-12, higher education or professional continuous service” (Holden & Westfall, 2006). Daniel and Marquis (1988) defined interaction in distance education: the simplest form of learners being in two-way contact with a person or persons. Arnold Seigal, Ellen Wagner, Nofflet Williams, and Michael G. Moore discussed the following questions at the panel titled “The Surprising Component of Distance Education” held in Salt Lake City on April 16, 1989 (Moore, 1989).

- What level of education should be for effective learning?
- What is effective interaction?
- How to achieve effective interaction?
- What are the benefits of real-time interaction?
- Is it worth the cost to interact?

In the panel, Moore (1989) suggested that interaction should be examined in 3 sub-types "interaction with content", "interaction with the teacher" and "interaction with the learner" and stated that the distinction between these types should be understood and that this distinction would also be conceptually beneficial.

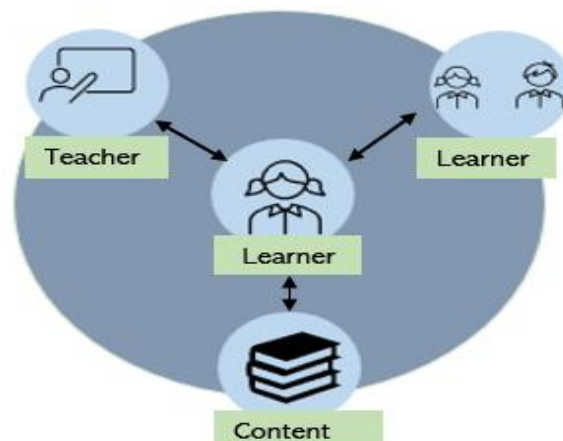


Figure 1. Types of Interaction

Apart from these interaction types, Anderson and Garrison (1998) expanded the interaction types specified by Moore. They brought the teacher-teacher, teacher-content, and content-content interactions into the literature. Bouhnik and Marcus (2006) suggested "interaction with the system" as a fourth interaction category and stated that the interface has an important place in learning processes. According to Jung et al. (2002); interaction has been examined in 3 dimensions according to its aims,

that is, academic, social, and collaborative interaction. There are also many types of interactions with classifications from various perspectives.

### **Interaction Types**

Interaction increases the standards of learning processes and learner experiences. The effect of interaction on the development of active learning, high-level knowledge, and 21st-century skills is undeniable (Woo & Reeves, 2007). It would be beneficial to examine the interaction (Moore, 2001), which is one of the most important factors in distance education processes, in terms of learner-content, learner-teacher, and learner-learner.

***Learner-content interaction:*** It is the state of mutual interaction between the learner and the content of the course. Through this communication, the learner achieves the targeted gains with individual study and effort. In the process, the learner reads or watches the content, performs the applications, receives feedback, and manages the learning process. In this way, the learner benefits from many structures at the same time (Tosun, Özgür & Şahin, 2009). Education cannot be fully realized without content interaction. Because this process enables the learner to change in mental and cognitive structures, understanding, and perspective and interact with the learning content in an intellectual way (Moore, 1989). It is an ancient method that Holmberg calls "internal didactic speech" and facilitates interaction with content. While the purpose of the texts in the Middle Ages was to provide instruction away from entertainment. The popularization of interaction tools and technologies changed the direction and amount of interaction with the content (Moore, 1989). As the amount and quality of learner-content interaction increases, the academic success of the student will increase as well. Sun, et al. (2017) analyzes the registration log of 426,211 learners in the e-learning portal of massive online learning systems and stated that the academic achievement of the learners who do not use the learning materials on the portal or who use it less often is lower than those who use it at a high level. In addition, similar results in 10 different types of learning materials show that learning content interaction is an important variable that predicts academic success. The frequency of interaction positively affects learning outcomes and contributes to learning task completion time was observed in another study investigating learner-content interaction on educational web pages (Brady, 2004).

***Learner-teacher interaction:*** This interaction type is defined as the mutual interaction between the learner and the teacher who prepares the subject material (Moore, 1989). The teacher interacts as a person who provides content and instructional support and also shares with students. (Yılmaz & Aktuğ, 2011). According to Horzum (2007), communication between the learner and teacher forms the ground of learning, and interaction is based on dialogue (Bernard et al., 2009). According to Moore (1989), the learner-teacher interaction planned in the curriculum increases the learner's interest, motivation, and orientation by enabling the content to reach the teaching objectives. The interaction with the teacher plays an important role in the learner's reception and response to the information given in distance education. The teacher gives individual feedback and corrections to the learners by making applications and evaluations and also makes changes and adjustments in their own strategies. The frequency and intensity of interactions vary according to the learner's education level, the teacher's personality, philosophy, and many factors. Avoiding interaction with learners will affect the learner's academic success (Booher & Seiler, 1982).

In order to inspire students as "subject area experts", teachers need to be able to demonstrate to students that they have the capacity to transfer knowledge. Certain rules must be observed for successful communication in the teaching process. These are (as cited by Hurst, McInnerney & Roberts, 2004):

- Understanding: Limiting the use of jargon and complex expressions in the content,
- Common ground: Sticking to the plan given at the beginning of the learning process,
- Perception: Teaching knowing that the learners are not field experts,
- Awareness: Awareness that learners struggle with new ideas, concepts, and technology

- Self-confidence: Self-confidence and keeping the dose at an adequate level when communicating with learners,
- Clarity: Keeping the narrative short and simple.

**Learner-learner interaction:** Learners are not only interacting with the content or the teacher but also interacting with each other. Learners develop critical thinking skills by creating online learning communities, analyzing course content, and sharing ideas, and deep learning can be achieved at the same time (Fuller, Kuhne & Frey, 2011). In the process of learner-learner interaction, known as the interaction between learners, it is not important whether the teacher is present or not (Moore, 1989). Learners can share and communicate with each other through group work or various communication channels (Yılmaz & Aktuğ, 2011). Quality community and group work are one of the modern world requirements, and being a member of a team is important. It is stated in the literature that; it is difficult to establish direct interaction in traditional and crowded classroom environments where face-to-face education takes place (Özdemir & Yalın, 2007). Since an effective interaction cannot be achieved, this type of interaction can be achieved by using recorded video, computer interactions, online learning groups, synchronous chat tools, and e-mail tools with higher performance. At the same time, the learner and teacher need to benefit from the interactions between the learners in the application and evaluation stages (Phillips, Santoro & Kuehn, 1988).

Motivation, which is an important component that enables learners to establish interpersonal interaction, is also effective in learner and content interaction. The interaction between learners and teachers is an important component of the success of distance education (Çuhadar, 2008; Mantyla, 1999; Lynch, 2002). Mantyla (1999) states that besides the features of interaction such as attracting attention and maintaining it, it is established for various purposes such as asking and answering questions, feedback, and being aware of learning goals. Driscoll and Carliner (2005) state that interaction has benefits such as motivation, recall, and increased attention, but there may be some limitations due to individuals and technical conditions. These limitations are that the interaction requires a certain amount of time, time constraints, content development costs, high expectations of learners, and the difficulty of interacting with everyone in large groups.

The variety and frequency of interaction in learning processes increase learner experiences (Wright, Marsh & Miller, 2000). According to the interaction and communication theory, it is stated that if there is a well-designed interaction type in the learning process, less time can be spent on other types of interaction, but it is also a good situation to have more than one interaction type effectively (Anderson, 2003). Mason (1994) stated that interactions lead learners to deep and meaningful learning (Brewer & Klein, 2006) and prompt them to think critically, as well as increase their interest and motivation towards the course and content in an affective sense. With positive interaction in distance education, the learner will be influenced by the teacher and will be willing to interact effectively with the content by benefiting from the teaching experiences in line with the learning goals and needs.

### **Interaction Technologies in Synchronous and Asynchronous Education**

When we look at the history of distance education, it has been observed that the situations that change the process are emerging technologies rather than educational resources. Moore compared the development of information communication systems in the 1990s to the future of radio at the beginning of the 20th century and television in the 1950s, referring to the failure of the expectation of dramatic change (Horzum, 2013). Developments in communication and interaction technologies have an important place in both face-to-face and distance education-based education systems. Today, developments in the dynamics of interaction technologies in distance education are an important factor in the increase of interactions in terms of more active and frequency. Simulations, hyperlinks, interactive games, virtual environments (Fuller, Kuhne & Frey, 2011), semantic web technologies, social networks, massive online courses (Kumtepe et al. 2019), and metaverse environments allow interactions to move from a limited understanding to a richer understanding. Interactive environments play a motivating role in the interaction of students with other students, teachers, and content in learning processes (Yılmaz & Aktuğ, 2011).

Various communication technologies used in distance education processes support both synchronous and asynchronous education. Jonassen and Kwon (2001) state that learners are in more interaction and communication in web-assisted learning environments than in face-to-face learning environments. In this respect, these learning environments attract the attention of educators (Özdemir & Kaya, 2007).

**Synchronous education** is realized by the simultaneous presence of students and teachers in virtual classrooms using tools such as computers, mobile phones, and tablets. Learners can ask questions and participate in discussions by establishing a live connection with each other or with the teacher (Pilanci, 2018). Virtual classrooms are environments where synchronous lectures or meetings are conducted. In addition, these environments can be divided into different sessions, and it is possible to conduct and manage courses and meetings at the same time. Most of the classroom experience, academic discussions, and social interaction opportunities allow instant audio and video interaction and sharing (file, desktop, etc.) with synchronous virtual classroom tools (Çınar et al., 2011). Zoom, Adobe Connect, Google Classroom, MS Teams, Blackboard Collaborate, and BigBlueButton are some of the virtual classroom implementations. Also, interactive web tools that can be used in synchronous education processes include Mentimeter, Quizizz, Socrative, Kahoot, etc. Learning management systems, which ensure the planned execution of e-learning activities, are like a connection point between asynchronous education and synchronous education (Baki et al., 2009).

**In asynchronous education**, there is no obligation to communicate at the same time. Audio-visual learning materials (such as interactive books, videos, presentations, and animations), messages, e-mail, forums, and blog pages support the asynchronous education process. These platforms both support the learning process and increase social interaction between learners. Social networking, collaborative learning material, software for preparing projects, etc. web tools allow learners to create virtual learning communities (Gürkan, 2012).

Asynchronous learning environments have the flexibility of time and space. This is also an advantage for learners. Since learners save time, they can structure their views and thoughts by examining them in detail (Kılıç, Horzum & Çakıroğlu, 2016), so their thinking skills also develop (Çuhadar, 2008).

### **Purpose of Research**

With the spread and development of online education, interaction has ceased to be a secret situation. On the other hand, increasing interest in social presence situations (Huss, Sela & Eastep, 2015) is a factor that increases the importance of interaction. Establishing interaction in the learning process provides an advantage, and its lack or lack of sufficient amount can turn into a disadvantage (Gürkan, 2012).

In the distance learning process, teachers and other decision-makers should make an effort related to interaction, which is a way to make their engagement with learners meaningful, and they should be able to address and manage a large audience. Learning, teaching, and content interaction are the main features of distance education. In addition, the interaction of these elements shapes the experiences of the learners (Ustati & Hasan, 2013). Carefully planned interaction enriches the learning and teaching process.

The scope, balance, and structure of the interaction that both the learner and the teacher can initiate in certain contexts of distance education should be well-defined (Simpson & Anderson, 2012). The lack of face-to-face communication in distance education (De la Varre, Keane & Irvin, 2011), inadequacy of communication and interaction between learners and teachers (Özudogru, 2021), causes negative experiences in the process (Huss, Sela & Eastep, 2015) and disappointment (Thorpe & Godwin, 2006). At the same time, the dimensions of interaction also affect the success of learning objectives. On the other hand, there are synchronous and asynchronous interaction tools and applications, various multimedia technologies, strategies, methods, and techniques that support the active continuation of learner-teacher, learner-learner, and learner-content interactions. In this respect, there is no obstacle to establishing interaction. For this reason, this study focuses on effective and sustainable interaction. By examining the literature, 3 sub-objectives have emerged regarding which situations the research will deal with. These sub-objectives are;

1. For what purposes the interaction is established,

2. Which features and functions will increase the interaction and,
3. While establishing the interactions, which factors negatively affect this process?

This study is thought to be important because it creates a framework for interaction for institutions, instructional designers, academics, and researchers who are interested in the interaction dimension of distance education processes. On the other hand, it is aimed to reveal a comprehensive result by examining international studies on interaction in distance education processes with qualitative meta-synthesis and turning them into codes and themes again. These studies were grouped under the determined criteria and re-evaluated with qualitative findings and comments. In this respect, it is considered to be important. On the other hand, there are various studies on interaction in distance education. However, these studies have generally been studied on a field basis. In this research, the interaction of the interaction elements with each other is discussed from a realistic and holistic perspective. And the interaction was re-examined by combining the findings of the selected studies to determine the whole. Because the number of interaction studies handled from this point of view in the literature is quite limited.

### Method

In this study, which examines qualitative research on interaction in distance education, a three-stage path was followed to ensure the objective approach of the researchers and to reduce the bias. These steps are:

1. Determination of criteria for the selection of studies and databases to be examined
2. Evaluation of the studies depending on the criteria and determination of the studies to be included in the research
3. Qualitative meta-synthesis of studies included in the research process

The meta-synthesis method aims to interpret the qualitative findings of the studies to be examined within the criteria, organize, and divide them into themes (Sandelowski, Docherty & Emden, 1997). The synthesis of qualitative studies is the collection of findings that are conceptually larger than the sum of the parts under the determined themes (Campbell et al., 2011). When the literature is examined, it is seen that there are two different views on the meta-synthesis method. The first view states that only qualitative data should be used in meta-synthesis (Jensen & Allen 1996; Sandelowski, Docherty & Emden, 1997; Çalık & Sözbilir, 2014), the other view is that quantitative data can be used with qualitative data (Strobel & Van Barneveld, 2009). However, the use of quantitative data in the process complies with the structure of meta-analysis. In this study, it is thought that only qualitative findings are suitable for the structure of the meta-synthesis method. In order to avoid possible confusion due to differences of opinion, the research methodology of this study was emphasized as a qualitative meta-synthesis.

Qualitative findings of interaction studies in synchronous and asynchronous education were analyzed by content analysis and separated into codes. Codes with similar features were categorized and interpreted under the determined themes. These studies can be called “evaluation of evaluations” (Polat & Osman, 2016 cited by Patton). In this study, international databases that examine the subject of interaction in distance education and which have the most studies in terms of scientific quality were selected. The databases examined and the results found are given below.

Table 1.  
Databases Examined within the Scope of the Research

Database	Conclusion
Academic Search Premier (EBSCO)	173
Scopus	434
Education Resources Information Center (ERIC)	424
Total	1031

Within the scope of the research, the most extensive search results were obtained in Academic Search Premier (EBSCO), Scopus, and Education Resources Information Center (ERIC) databases. In this respect, a total of 1031 studies were reached in these databases.

Table 2.  
Inclusion Criteria for Research

Research Area	Criterion
Subject Terms	distance learning or far away education or online education or online learning and “ interaction
Method	Qualitative research
Language	English

During the research, “distance learning, distance education, online education, online learning, interaction” keywords were used. These keywords were searched for subject terms in each database and as a result of the searches, 1031 studies were found and explained in the context of inclusion-exclusion in the PRISMA flowchart below.

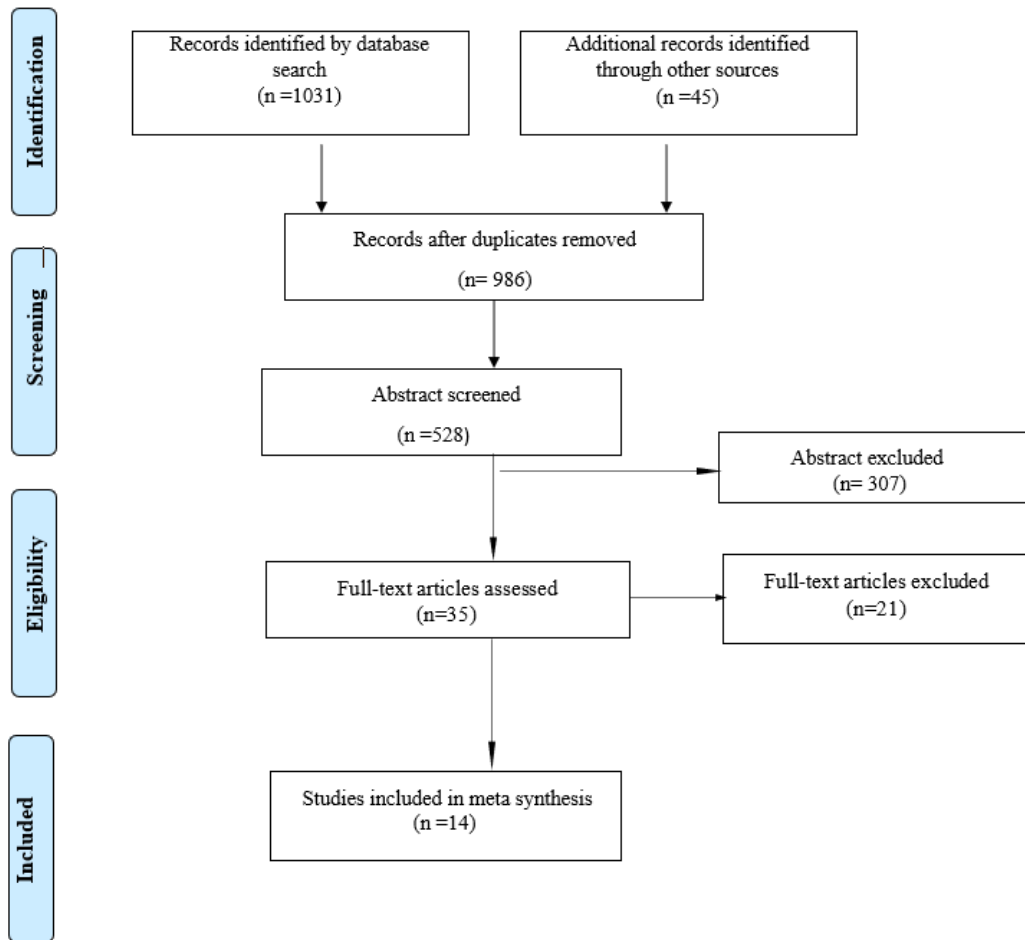


Figure 2. PRISMA flow chart of included studies

In this study by database search, 1031 records were identified. Of these studies, 45 were excluded because of duplications. After duplicates were removed, 986 records were screened by title. As a result of the title screened, 458 unrelated articles were excluded because they did not examine the interaction in distance education and did not match the problem situation of the research. 221 articles were excluded because they were not suitable for the research purpose. 270 articles did not comply with the research method, 21 articles were eliminated because they were thought not to provide a sufficient contribution to the research and according to the criteria, a total of 14 studies were considered suitable for qualitative meta-synthesis. Drawing attention to the importance of limiting between 10 and 12 studies in order to enrich the analysis and interpretation processes in meta-synthesis studies, Bondas and Hall (2007) emphasized the importance of less study-intensive analysis. In this study, 14 studies rich in data were included in the synthesis process, considering this matter.

The analysis of the identified studies was done by content analysis. The main purpose of content analysis is to determine the relationships between the data and to reach the concepts that will explain

these relationships. From this point of view, it can be expressed as an understandable interpretation of concepts similar to each other by combining them under determined codes and themes (Yıldırım & Şimşek, 2011). In line with the determined aims and criteria of the research, the articles were examined in detail, and themes were formed again in terms of meaning and structure. Accordingly, the themes of this study on interaction in synchronous and asynchronous distance education processes are as in Table 3.

Table 3.  
Qualitative Meta Synthesis Code Template

Themes	Theme Code
The purposes for which interactions are established	E1
Through which features and functions, interactions can be increased	E2
What factors negatively affected this process at the time the interactions were established?	E3

The qualitative meta-synthesis process was carried out in January-June 2022. The studies included in the research process were coded as “M1, M2, M3....-M14” and content analysis was performed. First of all, the identified studies were examined in detail. All of the codes and themes in the findings of the studies examined were combined in a single file. Codes and themes were re-examined and categorized. Cohen's (1960) Kappa statistic was used to calculate the interrater reliability in the content analysis process. After a consensus was reached between the raters, it was observed that the coherence values for E1, E2, and E3 are as follows “0.83, 0.80, 0.82”. At the same time, some studies in which codes and themes were determined were cited and it was aimed to contribute to the reliability of this study.

Table 4.  
Studies Included in Qualitative Meta-Synthesis

Code	Writer	Year	Theme
M1	Niemann, R.	2017	E2
M2	Forrer, D., Bechtel, S., Brown, K., Mabesa Jr., J., Gunn, L., Hayes, RL, & Wilmore, T.	2019	E2
M3	Cetinkaya, L., & Keser, H.	2018	E2
M4	Huss , JA, Sela, O., & Eastep , S.	2015	E2, E3
M5	Diaz , LA, & Entonado , FB	2009	E2
M6	Offir , B., Barth , I, Lev , J., & Shteinbok	2005	E2
M7	De la Varre , C., Keane , J., & Irvin , MJ	2011	E2, E3
M8	Nandi , D., Hamilton, M., & Harland , J.	2012	E1
M9	Michinov , N., & Michinov , E.	2008	E1
M10	Vrasidas , C. & McIsaac , S.M.	1999	E2, E3
M11	Thorpe, M. & Godwin, S.	2006	E2, E3
M12	Vlachopoulos , D., & Makri , A.	2019	E2
M13	Kelsey, K.D.	2009	E3
M14	Muhirwa, J.M.	2009	E3

In Table 4, the codes of the articles included in the qualitative meta-synthesis, the authors, the year of publication, and the theme of the finding are shared.



Table 5.  
Information About Studies Included in Qualitative Meta-Synthesis

Working Code	Source of research data	Methodology	Geography where the work took place	Data collection technique	Data analysis method
M1	10-12th grade (14) learner	Design-based research model	South Africa	Semi-structured interview	Content analysis
M2	Lecturer (36)	Case study	USA	Focus group interview	Content analysis
M3	Lecturer (9)	Case study	Turkey	Delphi method	Content analysis
M4	Lecturer (7)	Phenomenological research model	USA	Meeting	Content analysis
M5	Take an online course (8) teach (8) learner	Mixed research method	Spain	Interview and focus group discussion	Content analysis
M6	7th and 8th Grade (22) learner 11th Grade (25) learner	Mixed research method	Israel	Observation and interview	Content analysis
M7	Online learner-teacher message texts at K12 level	Mixed research method	USA	Document/record review	Content analysis
M8	Online course discussion forum learner message texts	Case study	Australia	Document/record review	Content analysis
M9	Online course 6 learners	Case study	France	Observation and interview	Content analysis
M10	Instructor and 8 learners	Case study	USA	Semi-structured interview, document /record review, observation	Content analysis
M11	15 online course students	Case study	Britain	Survey questionnaire	Content analysis
M12	Articles dealing with learners in higher education	Mixed research method	Britain	Document/record review	Content analysis
M13	Online course 47 learners	Phenomenological research model	USA and Canada	Observation and interview	Content analysis
M14	Online lecture video recordings	Action research	Africa	Document/record review and interview	Content analysis

In Table 5, the data collection source, research method, country of research, data collection technique (investigated in this study), and data analysis technique of the examined studies are given.

### Results

According to the data obtained as a result of the qualitative meta-synthesis, the themes of the purpose of interacting in synchronous and asynchronous distance education processes, which features, and functions will increase the interaction in distance education and the negative factors affecting the interaction have emerged. The findings were also modeled with tables and figures. In addition, direct

citations from the articles that are the source of the meta-synthesis were interpreted in detail and the reliability of the research was tried to be increased.

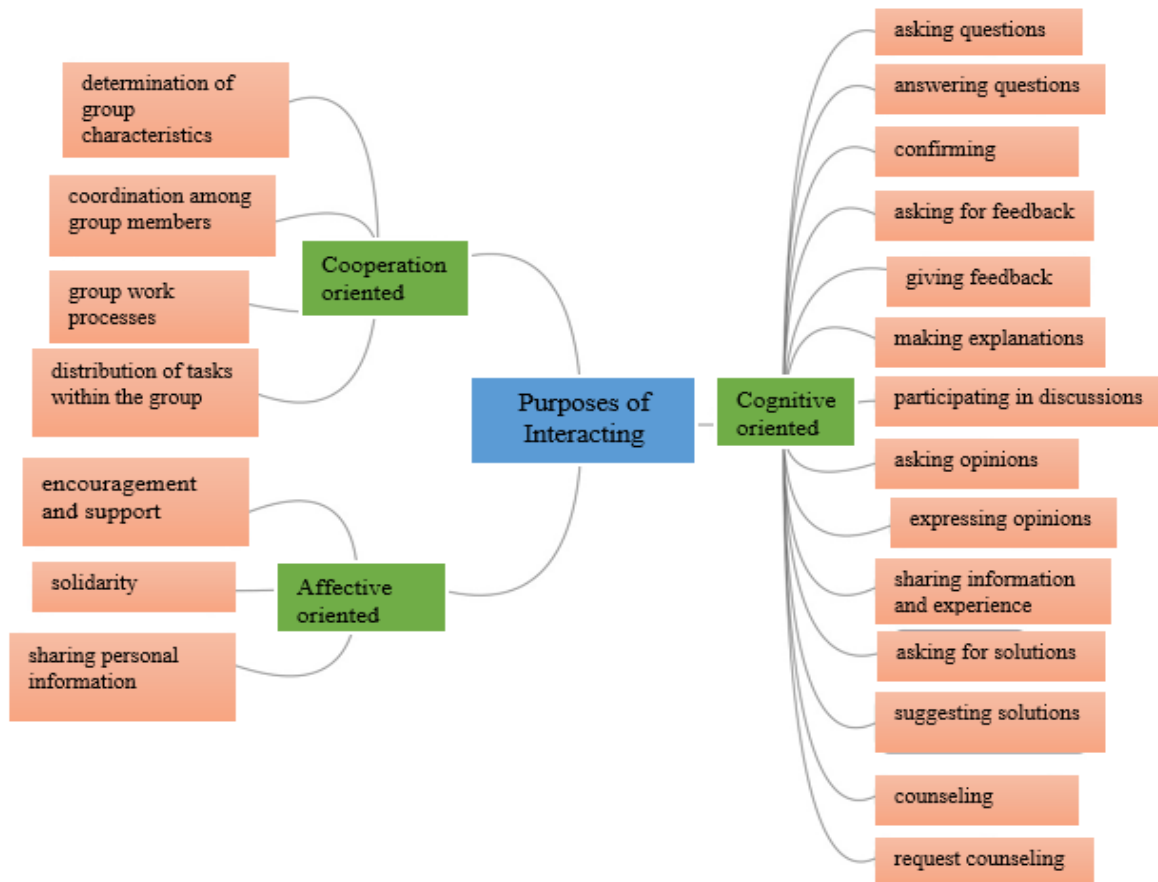


Figure 3. Purposes of interacting in synchronous and asynchronous distance education processes

In Figure 3, it has been observed that cognitive, affective, and collaborative interaction is established in the synchronous and asynchronous distance education process. The coding scheme of Bales' (1950) Interaction Process Analysis study was used to categorize the interaction objectives. Cognitive-oriented interaction purposes are “*asking questions, answering questions, confirming understanding, asking for feedback, giving feedback, making explanations, participating in discussions, asking opinions, expressing opinions, sharing information and experience, asking for solutions, suggesting solutions, counseling and request counseling*”. Socio-emotional processes such as “*encouragement and support, sharing personal information, solidarity (emotional support)*” come to fore among the aims of establishing affective oriented interaction. The aims of establishing cooperation-oriented interaction are “*determination of group characteristics (members and work area), coordination among group members, distribution of tasks within the group (expertise), group work processes*”. These aims are focused on the cooperation of learning groups in their working process. These codes are supported by the participants' opinions in the mentioned studies. In M8-page 14 stated that “I was wondering if there was some way once the first assignment had been uploaded to “web learn” whether it could be further modified or retrieved. (Intro to Prog\_D)” Other comments were “Will you be placing an answers section to the tutorial questions, so we can mark our own progress? (Intro to IT\_B)” and “When I access or send emails using a web-based account, such as yahoo or gmail, what protocols are at play? (Intro to IT\_B)” In M8-page 15 stated, “Look very carefully at all of the proximity functions and you’ll find one that is more suitable. (Intro to Prog\_C)”

As a result of the coding and exemplary citations, it is possible to state that the purposes of interacting in synchronous and asynchronous distance education processes are actually made for the realization of instructional goals and meaningful learning, and interaction is directly related to learner participation.

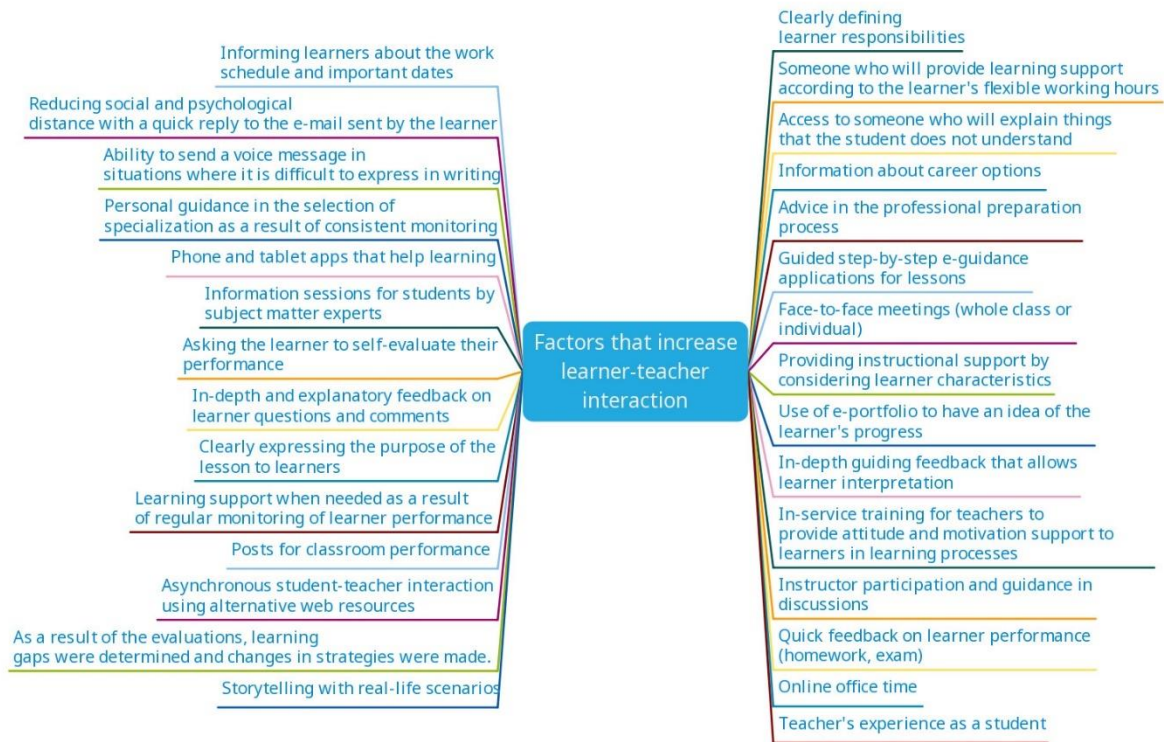


Figure 4. Factors that increase learner-teacher interaction

Findings on which features, or functions can increase the interaction were examined in 4 different categories. These categories are “learner-teacher, learner-learner, learner-content, and multiple interaction.” The multiple interaction categories refer to the interaction of more than one situation. From these findings, the learner-teacher interaction category was first interpreted. To increase learner-teacher interaction, learning responsibilities should be clearly announced to learners. In addition, step-by-step e-guidance applications are required for the courses. When the learners need instructional support in the learning process, support should be offered and not delayed to reduce the social and psychological distance in education. In the M1-page 97, “I mostly study at night and during weekends and then I need help.”, in another comment “I don’t want to wait for Impak’s subject expert to respond on my e-mail.” and in the same study, the learners say “We need more vocational options.” From here, supportive advice should be given to learners regarding their career options. And online office time should be arranged. New methods and strategies should be produced by eliminating the learning gaps that arise as a result of learner assessments, and phone and tablet applications should be used while establishing interactions. Interactions should be supported through face-to-face meetings if possible. It should be possible to establish a rapport with the learners where they can be given attitude and motivational support when necessary. In M4-page 77, an instructor supports the findings, stating that: “I wanted to insert myself into a class; I wanted to insert my personality for rapport building. That’s where the trust develops. I can push a student and challenge a student more when they know they can trust me.”

In this respect, a teacher can increase interaction by taking a supportive role in teaching. Kassandrinou, Angelaki, and Mavroidis (2014) expressed the role of the teacher in a supportive manner as facilitating quality communication and interaction by promoting it.

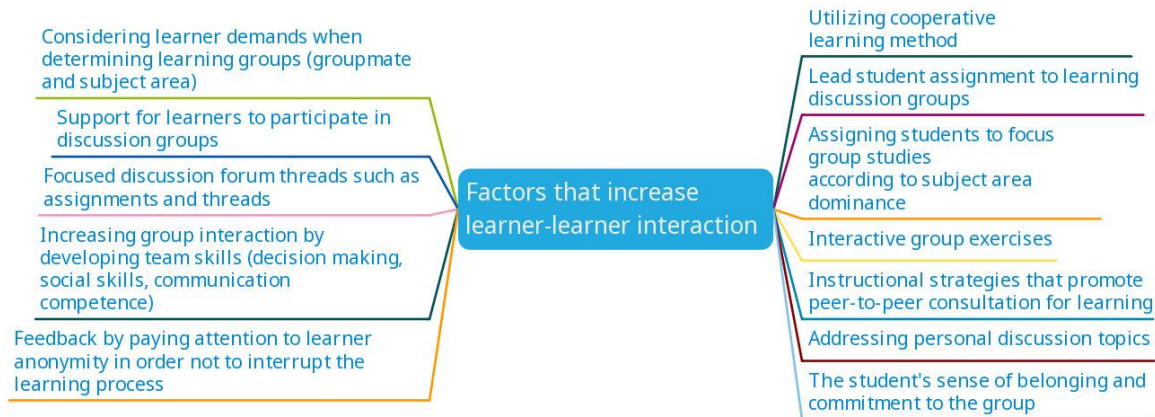


Figure 5. Factors that increase learner-learner interaction

Looking at Figure 5, the presence of learning tasks that require a cooperative learning method, team skills (decision-making, social skills, communication competence), and group work in the distance education process increases the learner-learner interaction. In M12-page 618, “*Online participants can communicate through interactive and collaborative projects by using synchronous and asynchronous tools.*” In the study coded M2-page 6 stated, “*Collaborate sessions bring the professor into a traditional online course. Requiring online collaboration several times per term will make students feel part of the class and help them feel comfortable with the material.*” On the other hand, in some cases, keeping the learner's identity confidential can positively affect peer communication. The learner can be kept confidential to ensure peer interaction. For example, in some learning situations, if the learner's identity remains hidden in the discussions, the learners express their thoughts more and participate. Thus, effective results can be achieved (Jong et al. 2013). For this reason, attention should be paid to learner anonymity. In summary, in order to increase communication and interaction between learners; group work and participation in discussion forums should be supported, and teaching strategies should be supportive of these interactions.

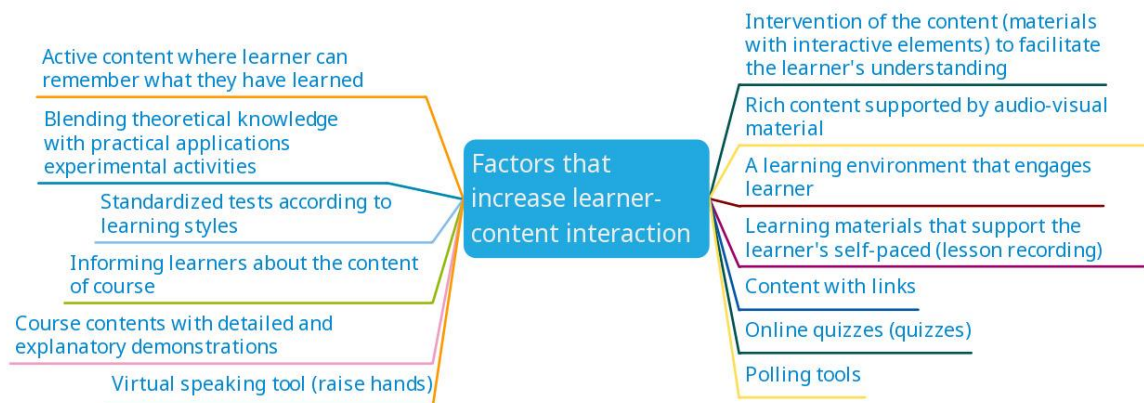


Figure 6. Factors that increase learner-content interaction

Some factors that increase learners' interaction with content include “a learning environment that engages learner, rich content supported by audio-visual materials, use of various interactive technologies and materials, availability of experimental activities where they can experience theoretical knowledge, course contents with detailed and explanatory demonstrations, use of standardized tests according to learning styles”. At the same time, supporting learners to progress at their own pace in the learning process increases the interaction of the learners with content in distance education processes. In the study coded M6 page 169 states that it is “An additional, asynchronous option that enabled students to download each week’s lesson for review at their own pace.” In M1 page 98, “I’d like to see how things work, especially where there are practical applications” comment



is stated. In the same coded study on page 97, the comment "Please, creative, innovative online presentations – not tutors just talking about the work" reveals that learners want content rich in audio-visual materials that they seek in presentations.

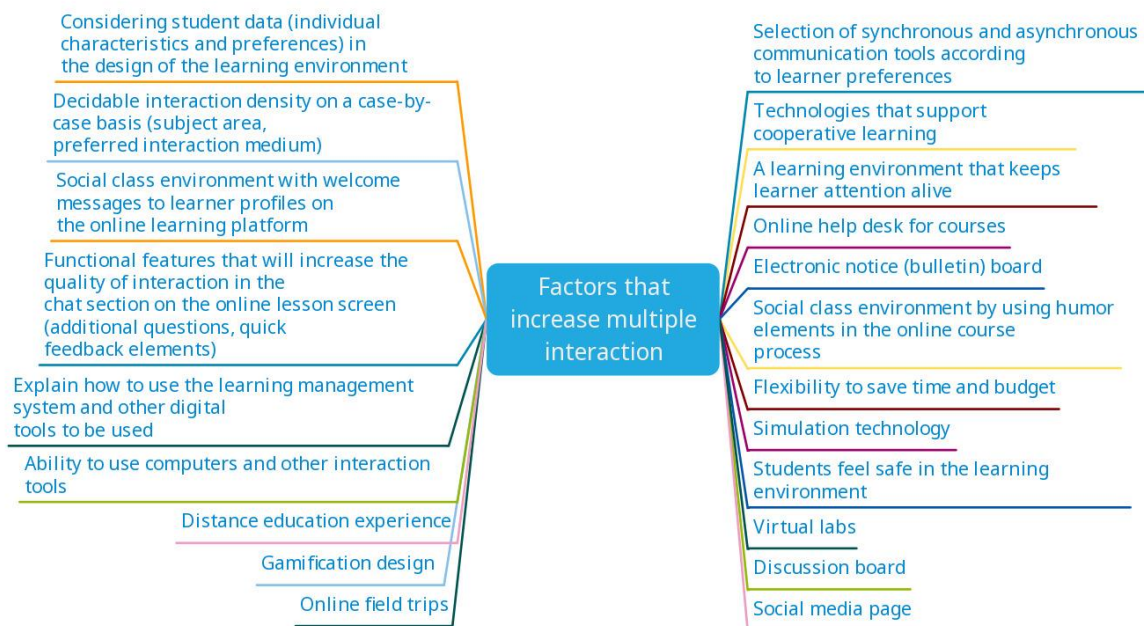


Figure 7. Factors that increase multiple interactions

Multiple interactions are valid when more than two interactions occur. In other words, it refers to the situations of learners interacting with more than one of them at the same time with teacher-content-interface. In literature, Martin, Parker, and Deale (2012) draw attention to the importance of this situation. For example, during an interaction that the learner has established by asking a question to the teacher through audio, video, written, or through the application, the involvement of other learners in the process, upon expressing their opinions, means multiple interactions.

According to the qualitative meta-synthesis findings in this study, to increase multiple interactions in the distance education process, the learning environment should be designed according to the interests and preferences of the learner, simulation technology, use of gamification elements in the design process, use of the virtual laboratory environment, online field trips, functional features in the chat section in the learning interface (feedback elements, etc.), a flexible distance education process, discussion boards, social media page for the course where current content and sharing can be made, an online help desk can be found in the learning environment. In the study coded M5 page 338 stated that "Intensity depends on the tool used in the online case where a link is created". While deciding the intensity of the interaction, the interaction tool determines the amount of interaction. In M3- page 147, the importance of learner preferences is emphasized by saying "learner characteristics in online interaction environments be considered and the employment of the synchronous and asynchronous tools which are appropriate could be useful." Forrer et al. (2019) also draw attention to a learning environment that attracts learners' attention by saying that designing the lessons in a way that will make the learners want to participate and increase the academic experience instead of just passing. In M11 page 210, a learner said "sharing ideas and gaining the confidence that my practice and ideas are similar to others. Being able to have questions answered quickly. (Education, level 1)" This learner who answers feels himself/herself in a positive and safe place by seeing that there are individuals with similar views in the learning environment he/she is in. At the same time, he draws attention to the importance of getting quick feedback in interaction processes.

Table 6.  
Adverse Situations Affecting Interaction

Negative Factors Affecting Interaction	
Based on Learner Sourced	<ul style="list-style-type: none"> <li>○ Hang about to put in enough effort</li> <li>○ Intention to get high marks</li> <li>○ Reluctance to participate in asynchronous discussions</li> <li>○ Negative experience in the process</li> <li>○ A feeling of being left behind by seeing more versed learners</li> <li>○ Feeling disappointment and anger due to negative perception of the lesson</li> <li>○ Hurrying to master the course content</li> <li>○ Incompatibility between learners</li> <li>○ Bored learners</li> <li>○ The learner thinks that it will be difficult to explain the problem in writing.</li> <li>○ Worry about being seen on camera</li> <li>○ Perceiving online discussions as a break</li> <li>○ Conflict between learners</li> <li>○ Concerns of dismissal in the community</li> <li>○ Low number of participant learners</li> </ul>
Based on Teacher	<ul style="list-style-type: none"> <li>○ The dominant learner is at the forefront when the teacher cannot manage the interaction process</li> <li>○ Teacher's bias towards learner-learner interactions in online courses</li> <li>○ Pedagogical inadequacy affecting the cooperation between learners negatively</li> <li>○ Lack of face-to-face communication</li> <li>○ Overpaid homework (workload)</li> <li>○ Delay of feedback</li> </ul>
Based on Learning Content	<ul style="list-style-type: none"> <li>○ The type of learning activities of the course does not allow for interaction</li> <li>○ web (uptime)</li> <li>○ Insufficient online course time to interact due to the intensity of the content</li> <li>○ The idea that is sufficient to transfer existing resources to the digital environment</li> <li>○ Incomprehensible learning material</li> <li>○ Excess text-based learning content</li> <li>○ The learning content consists of only low-level learning objectives</li> </ul>
Other	<ul style="list-style-type: none"> <li>○ Lack or absence of technical support units</li> <li>○ Ineffectiveness of interaction elements in the learning environment</li> <li>○ Multitude of messages in online chat platform</li> <li>○ Device incompatibility with interactive course component</li> <li>○ Slow connection or disconnection</li> <li>○ Lack of ability to use technology</li> </ul>

Negative situations affecting the interaction process in distance education are given in Table 6. Negative situations affecting the interaction process were examined in 4 dimensions based on the learner, teacher, content, and others. In the study coded M11, page 215, “Online tutorials often attract a poor response. If there is a point you don’t understand it is sometimes hard to express your thoughts in writing and tutorials are often stretched over a long period. (Social Science, level 2)” is stated as the negative experience encountered during the interaction process. This comment indicates the difficulty of stating the problem of the learner to the teacher in writing in the asynchronous interaction process. On the other hand, instructors' delay in feedback also negatively affects the interaction. In M10 page 9, it was stated that the learners perceived participating in asynchronous discussions as a “workload” and therefore they were reluctant to participate. In M14 page 12 the learners evaluated the interaction they experienced in distance education as “listening to the radio with high noise”, which shows a significant deficiency in both the connection quality and the pedagogical approach (interactive materials, methods, and strategies). In the same study, it should be noted that:

More importantly, from a pedagogy standpoint, it should be noted that the questions and answers above belong to the lowest levels of Bloom’s Taxonomy of Educational Objectives

(1956). They are about knowledge and comprehension. Thus, they fall short of addressing the higher levels of application, analysis, and synthesis that professionals in SSA need so badly.

The M13 coded study the possible impact of negative situations in technology use “For example, time is in a contingent relationship with technology failures. If the technology failed, then there was little time during the presentation” reveals on page 69.

In M10 page 12 a teacher states that “I felt I got much less engagement from the students in the online portion because they saw it as taking a break from the class, rather than they were required to engage on those online weeks.” The teacher states that learners do not see online interactions as a part of the learning process but feel like a break, and this perception reduces interaction.

### **Conclusion and Suggestions**

As a result of the qualitative meta-synthesis of the subject of interaction in synchronous and asynchronous distance education processes, comprehensive results have been achieved. With the in-depth examination of 14 studies by making meta-synthesis, themes, and codes were reached in the title of the purposes of establishing interaction in distance education, factors that increase interaction, and the negative situations experienced in this process.

Based on the research findings, interactions are established with cognitive, affective, and collaborative purposes in the distance education process. The purposes of cognitively-focused interaction include asking and answering questions, validating, giving feedback, making explanations, participating in discussions, asking and expressing opinions, sharing knowledge and experience, suggesting and offering solutions, and asking for and giving direction. Díaz and Entonado (2009) stated that the purpose of the interaction is to coach learners by assuming the role of guide and mentor in e-learning environments, and Moore (1989) stated that interaction is made to change the mental and cognitive structures of individuals. The goals of affectively focused interaction include encouragement and support, personal information sharing, solidarity and emotional support. Jung et al. (2002) and Çuhadar (2008)'s social purpose interaction is compatible with the purpose of interaction. Interaction with the content is not included in this dimension, here it is more about social interactions about extracurricular issues. Jung et al. (2002) described one of the purposes of interaction as academic. In this study, it was thought that it would be appropriate to specify a cognitive focus since it was noticed that there were interactions to achieve cognitive goals and objectives. On the other hand, the purposes of establishing cooperation-oriented interaction include determining group characteristics, coordination among group members, distribution of tasks within the group, and group work processes. A group of learners working on a specific topic, expressing their opinions, preparing materials, and sharing (Adelskold, 1999; Jung et al., 2002) are among the purposes of cooperation-oriented interaction. When the literature (Gunawardena & Zittle, 1997; Kanuka & Anderson, 1998; Adelskold, 1999; Jung et al. 2002; Çuhadar, 2008) and the functions of interaction tools and technologies are examined, it is seen that the purposes of establishing interaction are compatible with these findings of the research.

Interaction was analyzed separately as learner-content, learner-teacher, learner-learner and multiple interaction. In order to have rich learning experiences in synchronous and asynchronous learning environments, learners should make an effort by knowing the way to establish learner-teacher-content interaction (Çuhadar, 2008). Among the features related to the content design process to increase learner-content interaction; there should be materials containing interaction elements that facilitate learner's understanding, active content that facilitates remembering, and rich content supported by audio-visual materials. While learning content blended with experimental activities (Niemann, 2017) provides permanence in knowledge, asynchronous education, which provides progress according to the speed of the learner, contributes to individual learning. The presence of links to various materials and educational web pages, detailed-explanatory demonstrations, and quizzes in online courses will increase the frequency of interaction of the learner with the content. In addition, the existence of standardized tests according to learning styles will increase the attractiveness of the learning environment.

The learner can interact with the content by ensuring learner participation in course materials and activities prepared in different types (Yılmaz & Aktuğ, 2011). Kaysi and Aydemir (2017) emphasize the importance of detailed and descriptive content rich in audio-visual materials, downloadable following the asynchronous education process, in increasing learner-content interaction. The instructions and explanations of the content, applications and tools that will support the asynchronous education of the learners should be presented understandably. Regardless of the learners' familiarity with new technologies, better learning outcomes can be achieved with appropriate guidance and access to course content (Vlachopoulos & Makri, 2019). Although interaction with content has a positive effect on academic achievement, interpersonal interactions have been examined more in previous studies (Bannan -Ritland, 2002; Zimmerman, 2012). For this reason, the use of links in learning content, the use of rich media that increase interaction (Carlson & Zmud, 1999; Daft & Lengel, 1984), raffles, educational games (Glover, 2013), and the use of humor elements (Vlachopoulos and Makri, 2019) can enable the learner to interact with the content.

Feedback and evaluation are of great importance in learner-teacher interaction (Graham et al. 2001). In distance learning processes, it is not always possible for learners to reach the teacher. For this reason, attention should be paid to the timing of feedback so that interactions are established healthily and teaching is not adversely affected (Çuhadar, 2008). At the same time, communication with the teacher should be easily accessible and fast. Quick feedback from the teachers (Kaba, 2019), being easily accessible, and a way of addressing students increase the participation of learners by attracting attention (Vlachopoulos & Makri, 2019). Holmes and Benders (2012) state that learners prefer lessons in which it is easy to establish a dialogue. Teachers must encourage the easy establishment of interactions (Kassandrinou, Angelaki & Mavroidis, 2014; Graham et al. 2001). It has also been observed that flexibility is an important issue in the frequency of interactions. Providing fast support at points that are not understood during the study hours of learners will increase mutual interaction. Benson and Samarawickrema (2009) state that the teacher will increase interactions by understanding learners, supporting dialogue and instructional structure, and at the same time, being flexible, adaptable, and active will facilitate the process. At the same time, online office hours and face-to-face meetings will also support efficient interaction (Huss, Sela, & Eastep, 2015). Kanuka and Anderson (1998) state that interpersonal and social interaction between learners and teachers may contribute to the frequency of interaction. Being able to communicate with the teacher through multiple communication channels and fast feedback will both provide richness in communication and help individual learning to take place (Bozkurt, 2016). In addition, the teacher should be able to provide personal direction and guidance as a result of consistent monitoring (Niemann, 2017) and should enable the organization of informative professional sessions for learners based on branches. So, teacher preparation is an important condition for the success of interaction (Andresen, 2009). At the same time, the teacher can give the learner opportunity to review the interaction bond by providing self-evaluation. It should be able to keep strong cognitive and affective interaction with learners by sharing about classroom performance. Teachers' positive experiences in distance education and their ability to use technology are among the features that increase the frequency of interactions and learner satisfaction (Jackson, Jones & Rodriguez, 2010). At the same time, the frequency of interaction also affects the interest in the course (Kaba, 2019).

The teacher should be able to support teaching strategies with appropriate technology to interact with and maintain learners (Çuhadar, 2008). Two-way interactions between learners and teachers should be supported technically and academically ( Ustati & Hassan, 2013). In -service training for the teacher can be provided to support learners with affective-oriented interaction such as attitude and motivation in the learning processes. Padavano and Gould (2005) stated that the teacher's course roadmap and interactive content preparation, guiding learners will increase interaction. Horzum (2010) states that the development of materials in distance education, besides the educational dimensions, workforce, personnel, and financial elements should also be taken into consideration.

In learner-centered distance education courses, planning should be done at the beginning of the design process, which interaction element will be used, its' timing, which learning environments and technologies will be used, following the objectives and acquisitions, taking into account the learner characteristics. While planning, it should not be ignored that the learning process is learner-centered



(Çuhadar & Kılıcı, 2007). In the design of the courses, many application tools enrich the interaction processes. Which one to use can be decided according to the purposes of the activity. The important point is the strategic use of technology that will increase the quality of educational experiences and ensure that learners are satisfied with the education they receive. Previous studies (Shackelford & Maxwell, 2012) have also focused on this issue.

As a way of increasing interactions between learners, a person selected from among the learners can be appointed as the leader of the discussion groups. This person leads the group as a moderator (Gueldenzoph, 2003) and can avoid conflicts. To increase interaction between learners, researchers generally resort to cooperative learning methods. Particularly in synchronous communication, being a part of collaborative teams such as question-answers, chat rooms, forums, and group work enables learners to develop positive relationships by socializing with peer support (McInnerney & Roberts, 2004). The development of positive social relations in the learning environment also reflects positively on the social development of learners (Lee et al., 2004). For a positive interaction process, it is necessary to pay attention to the demands of the learners while determining the learning groups and subject areas. Because when the learner manages the interaction process, there will be a desire to participate in the lesson (Díaz & Entonado, 2009). In order not to harm social relations between learners, feedback can be made by paying attention to learner anonymity (Jong et al., 2013).

Some issues need to be controlled to ensure effective and meaningful learning interaction among learners. These are support, competence, and independence. Instructional support is necessary for meaningful learning and the realization of targeted gains. Being able to use synchronous and asynchronous communication technologies and being sufficient in learning content enables independent learning to take place (Anderson & Garrison, 1998).

Multi-interaction is discussed in terms of involving learners in more than one interaction with the teacher, content, or other learners. The use of gamification design elements in the learning environment increases the interaction between learners (Glover, 2013; Yıldırım & Demir, 2016). At the same time, the use of gamification design elements in the learning environment increases the interaction of learners with the teacher (Bergmann & Sams, 2012). Because learners feel socialized and comfortable. The use of technologies that support cooperative learning in the learning process (Çetinkaya & Keser, 2018; Huss, Sela & Eastep, 2015) will increase the interaction of learners with content and between learners. On the other hand, the adequacy of technology skills (Tsui & Ki, 1996; Vrasidas & McIsaac, 1999) will affect not only the interaction of learners with the teacher but also the interaction of learners with both content and learners. In this respect, the presence of an online help desk will provide support on technical issues (Ofir et al., 2005), but initiatives to increase technology skills should also be supported. At the same time, students can be introduced to how to use learning management systems and other digital tools with orientation training at the beginning of the education process. Interaction tools through which learners interact with the teacher and content should be flexible and adaptive. Supporting different operating systems and supporting mobile applications will also be suitable for the flexibility of distance education. The functionality of tools that teach and interact with content affects the frequency and quality of the interaction. In this regard, items such as a quick feedback element and a question button can be used (Kuyath et al., 2013). As a result of rapid feedback, learners can reflect knowledge they have acquired, while teachers who identify knowledge gaps contribute to learners' learning experiences by encouraging various learning strategies (Vlachopoulos & Makri 2017).

A learning environment that considers learner characteristics and keeps the learner's attention alive will enable learners to interact in three ways. There should be an electronic notice board and a discussion board to maintain asynchronous interaction in the online learning platform (Huss, Sela & Eastep, 2015; Offir et al., 2005). Learners and teachers should be enabled to share actively. At the same time, multiple interactions can be supported by using social media tools. On the other hand, there should be initiatives that will increase the learner's sense of belonging and social presence. Social intimacy between learners, online communication, and interactive activities can create intimacy between learners. Because social presence and interaction increase in direct proportion (Tu & McIsaac, 2002). In an online learning platform, a social class environment can be created by using

welcome messages to learner profiles, the social class environment, and humor elements during the lesson (Wise et al. 2004). Having experience in distance education (Vrasidas & McIsaac, 1999) and knowing how the learning process works will reflect positively on multiple interactions. In this way, the learner will interact and maintain with other interaction elements because he/she feels safe. The learner can be supported to have real learning experiences or technologies such as simulation, virtual laboratory, and online field trips can be used to make them feel this. According to Klassen and Willoughby (2003), simulation is a method that reduces costs without endangering life. Studies have shown that learners participate more in the lesson while simulating the task. Active participation of the learner in the learning experience increases the permanence of knowledge and encourages a positive learning environment. Multimedia resources offer a learning process that learners enjoy and have a variety of learning experiences (Thorpe & Godwin, 2006; Díaz & Entonado, 2009). In addition, independent software, high-quality explanations, and audio-visual displays can be perceived as real by learners and there may be a better education process than face-to-face education (Thorpe & Godwin, 2006).

According to results obtained from findings for the third purpose of research, negative situations affecting interaction were examined in four different categories. These are differentiated as the learner, teacher, content, and other resources. Based on learner situations; De la Varre, Keane, and Irvin (2011) who talk about learners who are not enthusiastic about trying and are reluctant to participate in asynchronous discussions, state that asynchronous interaction requires more effort, and it is easier to communicate with the teacher during the synchronous lesson process. Some learners want to interact with high-grade intention (Vrasidas & McIsaac, 1999). Although this is not seen as a negative situation, the constant interaction of certain learners can create reluctance and anger in other learners. By thinking that other learners are more knowledgeable or advanced, their self-confidence may be shaken and a feeling of being left behind will occur. This is also a situation that can cause the teacher to be mistaken. Incompatibility and disagreement among learners also affect the interaction negatively. Negative perceptions about the lesson and feelings of anger can occur in negative experiences. On the other hand, the frequency of interaction may decrease as it is rushed to dominate the content. Because the presence of too many messages on the chat and messaging screen suggests that it may take time for learners to interact. Sometimes, discussion activities are seen as unnecessary and perceived as a break activity (Vrasidas & McIsaac, 1999) or the learner has difficulty describing the problem in written form. The fear of being disgraced by the community and the anxiety of being seen on camera (Kelsey, 2009) are also situations that negatively affect interaction. In synchronous lessons, low attendance affects learner interaction negatively, while its excess causes confusion and administrative problems (Üstündağ & Güyer, 2007).

In cases where the teacher cannot manage the interaction process, the dominant learner can be in the foreground. In addition, the prejudice of the teacher against the interactions between learners in online courses and inadequacy of the pedagogical knowledge of learner behaviors can negatively affect the social dynamics and cooperation of the classroom as well as affect the interaction process (Thorpe & Godwin, 2006). Moreover; Lack of face-to-face communication, over-given homework, workload, and delayed feedback (Stevenson, Sander & Naylor, 1996) are also negative situations. Among the situations that negatively affect the interaction with content in the literature, they provide low interaction due to one-way course activities or an increase in time spent online due to the intense content. Kelsey (2009) stated that learners have little time for interaction during the synchronous lesson, and the teacher hastily keeps interaction activities such as question-answer activities short in order not to exceed the lesson time. In addition, the direct transfer of learning content to digital media is considered sufficient by some teachers in the literature. Non-interactive and text-based learning content can negatively affect interaction and frequency. In this respect, the intensity of interaction should be decided according to saving time and budget in the subject area. In addition, discussion rules and ethical rules should be determined in asynchronous interactions so that the interaction does not lose its effect, and announcements of these rules should be made to the learners in advance (Çuhadar, 2008).

Lastly, there are other sources of negative factors affecting interaction in synchronous and asynchronous education processes. These are the lack of technical support units or insufficient

support, slow connection, non-functional interaction elements, interaction tool, device incompatibility, and lack of technological capability. Problems such as malfunctions and incompatible tool-software caused by interactive course components (web technologies) will inevitably cause feelings such as frustration and anger (Thorpe & Godwin, 2007, cited in Goodyear). To prevent such situations, it is recommended that the interaction process should be integrated into the course design in a planned way and that the technical support and live help units should work actively. In open and distance learning institutions, the number of personnel in support services for learners and teachers, system updates, and follow-up innovations in support services are important components in the frequency of 3 types of interaction (Durak, 2017). Especially in terms of ensuring active learner participation in lessons (Ak, Gökdaş, Öksüz & Torun, 2021) and continuity of interaction; organizing and periodically repeating training for teachers on interactions, content development, learning management system features and usage (Duzakin & Yalçınkaya, 2008) are necessary.

Finally, suggestions for researchers and application area of this study (learning designers, distance education centers, teachers) are before design, it is recommended to consider negative situations that affect interaction and factors that increase interaction. In addition, it is foreseen that it will be useful as a model for the purposes for which planned interaction will be established. On the other hand, based on the results of this study, interactive learning environments for different study groups can be developed. And the relationship between the level of interaction and variables such as academic achievement, motivation, and social presence can be examined.

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**Ethic Statement:** In this study, we declare that the rules stated in the "Higher Education Institutions Scientific Research and Publication Ethics Directive" are complied with and that we do not take any of the actions based on "Actions Against Scientific Research and Publication Ethics". At the same time, we declare that there is no conflict of interest between the authors, that all authors contribute to the study and that all the responsibility belongs to the article authors in case of all ethical violations.

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