

The Transactional Distance Theory and Distance Learning Contexts: Theory Integration, Research Gaps, and Future Agenda

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Abstract: Moore established transactional distance theory (TDT) to grasp transactional distance in the context of distance learning. Research using TDT in distance, open, and online learning environments has been undertaken. However, there are information gaps about what constitutes progress, future directions, and research deficits pertaining to TDT in the context of distance education. This systematic literature review (SLR) used PRISMA to analyze 42 papers to close the knowledge gap. Currently, TDT research in distance learning integrates various theories and models; nevertheless, there is a movement toward acceptance models and how to incorporate more relevant theories within the framework of distance learning. Future studies should integrate other aspects such as student motivation, student acceptance of technology, and student preparedness and desire to utilize technology in learning environments. As most research samples students, a research gap involving instructors and heterogeneous groups is proposed. It is projected that quantitative research will predominate in the future, leaving qualitative and mixed approaches as areas of investigation. This review illuminates the developments, future agenda, and research needs pertaining to TDT in the context of distance learning. It might serve as a foundation for future study on TDT in the context of distance, open, and online education.

Keywords: transactional distance theory; TDT; distance learning; instructional design

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1. Introduction

The term “distance learning” (DL) did not become widespread in use until the 1970s [1]. Early on, attempts were made to define it, and there were debates about what it was. One of the obstacles to distance learning was the geographic separation of learners and instructors, which was also a pedagogical concept. Moore’s proof and explanation that remote education was more concerned with pedagogy than geography [1,2] led him to establish transactional distance theory (TDT). Moore described TDT in 1973 as a discrepancy in psychological and communicative understanding that resulted from the interaction between structure and conversation. This cognitive gap might be a source of confusion between educators and their pupils [3,4]. This was an endless, relative, and ever-changing expanse; this gap or separation should have been eliminated or reduced. Though specialized, the fundamental idea was a subset of traditional teaching and learning since transactional distance existed even in formal education [5].

When it comes to DL, however, the physical separation between educators and students creates a greater sense of distance than is experienced in traditional classroom settings. Therefore, transactional distance (TD) between instructor and learner (TDT) was likely more troublesome at a distance and may have led to students’ sense of isolation, less motivation, and engagement, and, finally, attrition in early DL [2]. Moore initially

proposed [1] that DL architects should consider structure and dialogue as two elements that impact TD. When discussing DL, “dialogue” referred to the back-and-forth between the educator and student, while “structure” referred to the rigidity or flexibility of the teaching techniques and procedures. Distancing yourself is determined by how much time and effort were put into the conversation. The TD increased as there was less room for dialogue and more structure.

In a course with short TD, students are guided by constant “dialogue” [6]. This might be more suitable or appealing for learners with less confidence in controlling their studies. Moore subsequently acknowledged that with limited “dialogue,” pupils were compelled to make independent judgments and generally practice “autonomy” [2]. Later, along with Kearsley, he identified three interactive components or structures [7] that must be addressed to reduce TD and offer students a meaningful learning experience. In addition to the two essential components, “structure” and “dialogue,” he introduced a third, “autonomy.” This third hypothesized component, “autonomy,” interacts with both “structure” and “conversation” to build a model or theory for comprehending DL [7].

This was required to minimize the TD and have a practical distance module. In contrast, less “dialogue” and more “structure” increased the risk of TD, which in turn led to less effective DL [8]. Successful DL settings need the instructor to provide “dialogue-arranged learning resources” [8]. This became quite complicated. Identifying the required amount of “structure,” permitting “dialogue,” and promoting individual learner “autonomy” was arduous and multidimensional since the more significant the “structure” and the lower the “dialogue,” the more “autonomy” must be shown by the student. Figure 1 depicts a TDT overview.

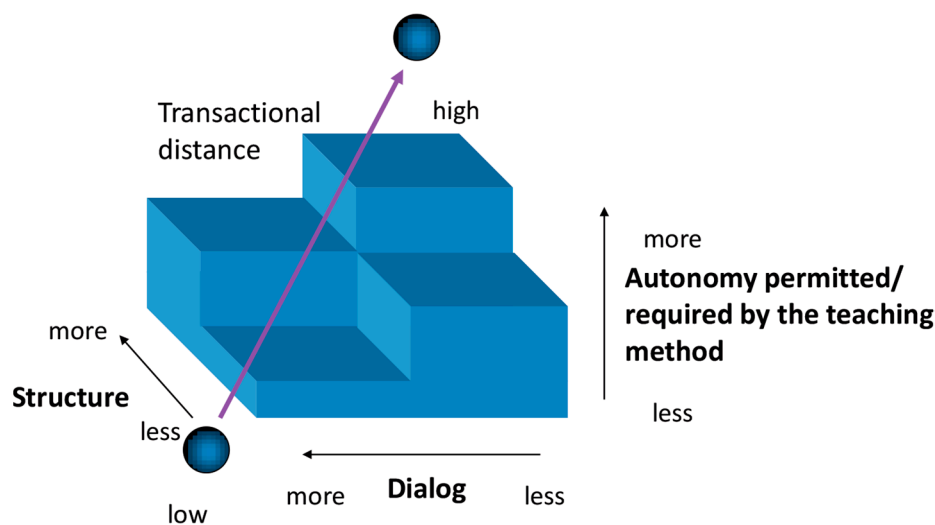


Figure 1. Transactional distance theory overview.

Numerous authors have addressed this issue [3,4,9–12], argued that TD is crucial, and viewed TDT as a critical analytical framework for studying DL systems. “TDT provides a useful conceptual framework for defining and understanding DL in general and as a source of research ideas in particular” [12]. In addition, the researchers cannot establish whether different theories should be included in their study model due to the rising interest in TDT. Moore, one of TDT’s creators, recognized one of TDT’s long-term research needs as the need to supplement TDT with other applicable theories and frameworks [3,4].

Consequently, the primary purpose of this systematic literature review (SLR) is to provide new information to future researchers on theory integration, future agendas, research gaps, and the research requirements of TDT in DL settings. The data greatly enhances the understanding of the current research landscape and future research gaps that need to be investigated. This will significantly advance our knowledge of TDT, both within and outside of the classroom, by illuminating TDT’s historical development and

promising future within the context of DL. Scientists might then focus their efforts on theories that are compatible with TDT. Our knowledge of what drives people would benefit from this.

Accordingly, this work aims to undertake an SLR that gives innovative information to future researchers about theory integration, future agendas, research gaps, and the research needs of TDT in distance learning contexts. Following this logic, the following questions have been developed for further study:

1. What theories do the preceding studies employ?
2. What variables were examined in the prior studies?
3. What kinds of samples were used in the prior studies?
4. What research methods and analyses were used for the preceding studies?
5. Where geographically were the preceding studies conducted?
6. What is the future agenda recommended by preceding studies?

2. TDT As a Theoretical Background for Educational Settings

Moore developed TDT, a widely used theory for designing and developing distance learning environments that has received worldwide and interdisciplinary acclaim. It creates instructional designs for distance and online learning environments [13–15], the framework for mobile learning MOOC settings [16], and ODL (open distance learning) [17]. TDT has been used in education for several objectives, including perceptions of excellent tutors and good tutor traits [18], anxiety performance in distance learning settings [19], optimal learning environment [20], and communication techniques between instructor and learners [21]. A list of theoretical background for educational settings based on TDT are illustrated in Table 1.

Table 1. TDT theoretical background in earlier research.

Purpose of TDT	Research
Instructional designs	[13,14]
Framework for mobile learning MOOC settings	[15]
ODL (open distance learning)	[17]
Perceptions of excellent tutors and good tutor traits	[18]
Anxiety performance in DL settings	[19]
Optimal learning environment	[20]
Communication techniques between instructor and learners	[21]

3. Materials and Methods

This comprehensive SLR seeks to clarify the evolution and future agenda of TDT in distance learning contexts using PRISMA, which stands for “Preferred Reporting Items for Systematic Reviews and Meta-Analyses,” and is a well-known standard for systematic reviews in many fields [22].

3.1. Exclusion and Inclusion Criteria

This study formulated several inclusion and exclusion criteria to ensure that the chosen articles came within its scope based on research questions obtained from previously identified research gaps. Establishing the inclusion and exclusion criteria is so necessary. This study’s inclusion and exclusion criteria were derived from exhaustive prior literature studies. Table 2 outlines the inclusion and exclusion criteria for this SLR.

Table 2. The exclusion and inclusion criteria.

Inclusion Criteria	Exclusion Criteria
TDT research in distance learning environments. Including TDT elements. Articles and conference papers. Writing in English.	TDT research in different environments than distance learning. Research not including TDT elements Book chapters, thesis, blogs. Any other languages.
The period from 2001 to 2021.	Publications in 2022 have been omitted since the year has not yet concluded. Publications in 2000 and 1999 have not yet concluded.

3.2. Data Sources and Search Strategies

The search for articles was conducted in December 2022. This study investigates all papers identified in the appropriate databases from 2001 to 2021; 2022 has been omitted since it is not yet complete. Thus, the phrase “exclude PUBYEAR 2022” or “exclude PUBYEAR 1999” was used to grant access to the relevant articles based on the timeline of this review. Since Scopus and Web of Science are two of the world’s most popular and frequently utilized indexing organizations, they were selected as data sources. An exact and exclusive set of keywords and search phrases were used to guarantee that this SLR includes extensive coverage of the scholarly literature on the topic at hand. “Transactional distance theory” and “distance learning” were used as keywords (TITLE-ABS-KEY (“Distance Learning”) AND TITLE-ABS-KEY (“Transactional Distance Theory”). The search phrases “transactional distance theory” and “distance learning” were used interchangeably in WoS.

Following a search of Scopus, 130 articles were included in the original draft of this study. This study’s first WoS data search returned 116 publications based on the search criteria. This analysis covered 246 papers published on TDT in the context of distance learning in both SCOPs and WoS. The researcher, for use in this study afterward, retrieved the article data produced by Scopus and WoS. It was found by comparing the two databases that 108 articles on the Web of Science are duplicated in Scopus. Initially, there were 246 articles, but after removing the duplicates, there are now just 138. Next, we looked for and downloaded the full articles from each of the 138 papers in our study. Despite several attempts, we could only extract 47 out of 138 items. Another 91 publications were downloaded for in-depth research.

Analysis based on the human review (manual evaluation) and specified inclusion and exclusion criteria decreased the number of papers to 42, which included research incorporating varied samples, statistical methodologies, geographical locations, and diverse viewpoints on SDT integration. The writers were happy with both the quantity and variety of papers. After screening using inclusion and exclusion criteria, we could not extract 47 out of 138 items, and 42 articles were rejected for various reasons, such as referring to “distance learning” only without using TDT in the study. Another reason was the use of materials from outside the academic environment. Moreover, the lack of a defined framework or aspect of TDT in the performed research is another ground for exclusion. Figure 2 shows the PRISMA framework for this study. All authors have agreed with the inclusion and exclusion of the selected papers.

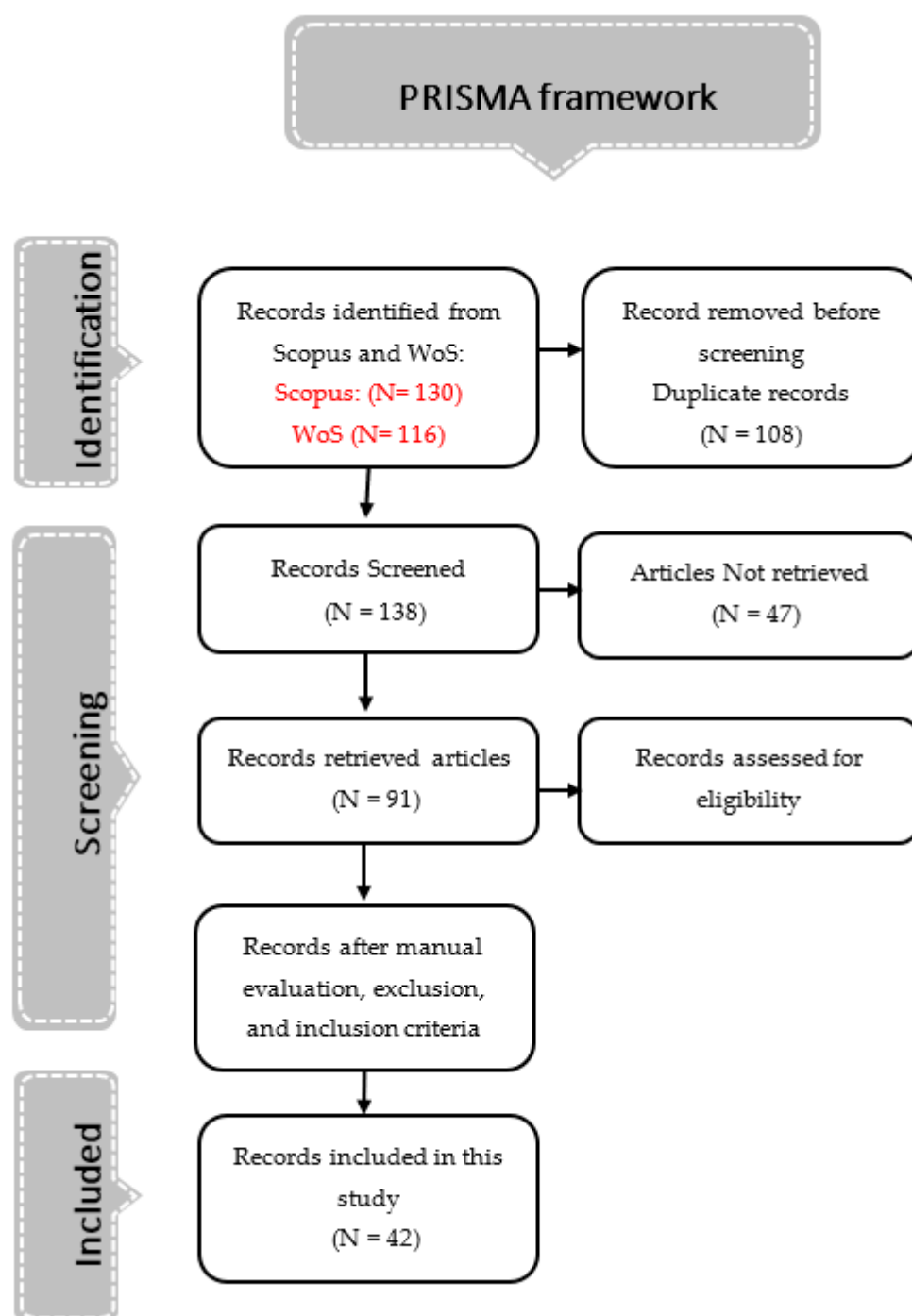


Figure 2. PRISMA framework.

4. Results

To accomplish the predetermined study objectives, the 42 publications that had been found, reviewed, and included by PRISMA [22] were critically and analytically analyzed to assess the direction and trends of TDT in DL research. The publications investigated and included in this systematic review are listed in Appendix A.

4.1. Theory Integration

The bulk of articles builds upon TDT with other theories. A total of 29 articles out of 42, or 69.048 percent of the total, include other theories in the SDT. The theories integrated with TDT are Bloom's taxonomy theory, the person–environment interaction model, the

theory of mediated learning experience (MLE), Computer-Based Scaffolds, the community of inquiry, rational analysis of mobile education (FRAME), self-regulated learning (SRL), the social cognitive theoretical framework, computer self-efficacy, cognitive load theory, activity theory, sociocultural theory, the social science theory, the cultural–historical theory, the activity theory, the transactional distance theory, the transactional control theory, shaping dwellings, and the stigmergy. The significant number of theories in TDT may be due to its strong explanatory power. As a consequence, TDT was combined with other theories and models to improve the explanatory capacity of such theories and models. This is not a new position or approach since it has existed in the past. The creator of TDT proposed and recommended its inclusion [12]. Consequently, we suggest and emphasize the significance of incorporating TDT with other theories in the context of distance learning. Figure 2 depicts, based on our data, the proportion of different theories that have included the original TDT.

4.2. TDT Factors

Moore’s transactional distance theory (TDT) is a valuable paradigm for studying remote education [1,2,10–13,23]. TDT describes and quantifies the instructor–student learning interaction in distance education [24]. High TD between instructor and pupils may cause isolation, low motivation, and disengagement [2,23]. Moore identifies three TDT concepts: (1) structure, (2) interaction (or dialogue), and (3) learner autonomy [7].

The structure represents the interaction between the teacher, students, and technology [25–27]. Autonomy is the degree of structure needed; promoting interaction and fostering learner autonomy is difficult. The more structure and the less interaction, the more learner autonomy is necessary [7]. The dialogue that occurs as part of the learning process [10] assists students in conceptualizing [28]. Successful TD settings rely on the instructor delivering interaction and “appropriately” arranged learning resources. Greater, quicker, and more involved connection reduces psychological isolation [28,29]. Effective online learning requires well-structured information, the latest technology, and more interactivity [30].

In this review, we categorized the article based on the TDT factors used in their studies. Seven of the forty-two evaluated studies, or 16.667 percent, employed TDT factors (structure, dialogue, and learner autonomy) without any integration [15,31–36] based on an examination of the reviewed articles. In addition, 35 of the forty-two examined articles, or 83.333 percent, incorporated other aspects into TD theory.

One study [37] has integrated self-regulated learning (SRL) with TDT in their study. Moreover, the integration between TDT and Bloom’s taxonomy theory (BTT) was the theoretical framework of [38]. In one study [39], TDT was integrated with a person–environment interaction model. One study combined the theory of mediated learning experiences (MLE) with TDT [40]. In addition, the integration between problem-based learning, computer-based scaffolds, and TDT was found in one study [35]. At the same time, one study has integrated TDT and the community of inquiry (CoI) [41]. One study integrated the rational analysis of mobile education (FRAME) with TDT [42]. Another study combined the social cognitive theoretical framework with TDT [43]. Computer self-efficacy with TDT was integrated into [19]. The integration between multiple theories, cognitive load theory, activity theory, sociocultural theory, and TDT was found in [20]. The integration of TD, social science theory, cultural–historical theory, and activity theory is discussed in [13]. Finally, transactional distance, transactional control, shaping dwellings, and stigmergy were found in [38]. For example, ref. [44] studied only two TDT factors: structure and dialogue, leaving learning autonomy alone; ref. [45] examined only dialogue from the TDT (student–content, student–interface, student–instructor, and student–student interactions). Table 3 illustrates the TDT factors and TDT integrations utilized in the examined research.

Table 3. The TDT factors and TDT integrations utilized in the examined research.

TDT factors 16.667% (n = 7)	TDT Integration with Other Theories 83.333% (n = 35)
TD Theory without any integration was used as a theoretical framework	Theories integrated with TDT
	Self-regulated learning (SRL)
	Bloom's taxonomy theory (BTT)
	person-environment interaction model
	Problem-based learning
	Computer-based scaffolds
	Community of inquiry CoI
	The rational analysis of mobile education (FRAME)
	The social cognitive theoretical framework
	Cognitive load theory
	Activity theory
	Sociocultural theory
	The social science theory
	The cultural–historical theory
	Transactional distance
	Transactional control
	Shaping dwellings
	Stigmergy

4.3. Type of Samples

Understanding the kind of sample is essential for justifying the selection of samples for future research and understanding the present knowledge gap in the context of TDT research and distance learning. In light of the theory's focus on human happiness as its endpoint, TDT studies are almost exclusively conducted with people in mind [9,16,38,41,46–49]. Based on our examination of the samples used in the selected publications, we can confidently say that the vast majority of samples for SDT studies of online education consist primarily of students. Thirty-five total samples were obtained, with 83.333 percent coming from students. In just 4.76 percent of the studies, lecturer samples existed (n = 2). In addition, 4.762% (n = 2) of the studies employed surveys of in-service teachers.

Moreover, both students and faculty administrators were surveyed in 2.381% (n = 1), and both students and module coordinators were surveyed in 2.381% (n = 1), as well as students and lecturers. It is possible that combining student and teacher samples is an effort to understand the motives behind the whole distance learning process from the viewpoints of both the information receiver and the instructor. In addition, under the guidance of faculty administrators, students will work closely with module coordinators to develop an in-depth comprehension of the defining features of course design concepts based on Moore's TD theory. The sample distribution of the analyzed articles is shown in Figure 3.

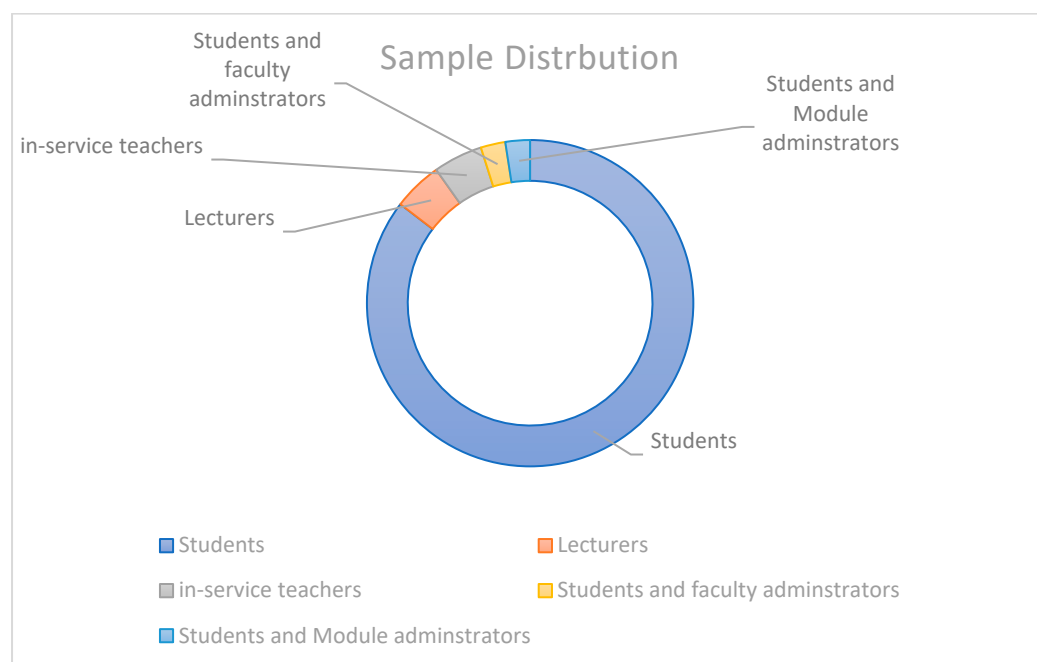


Figure 3. Sample distribution.

4.4. Research Techniques and Data Analysis

In the early days of TDT's development, quantitative research methodologies were employed to deduce the connections between TDT elements such as course structure, discourse, and student agency. Twenty-one papers, or 50% ($n = 21$), used quantitative research methodologies. Tactical decision-making (TDM) and the continuing online learning initiative [19–21,31,36,38–40,44,46–53] continue to use quantitative methodologies.

Quantitative methods, however, have seen a rise in favor as well. In this systematic literature review, only 19.048 percent ($n = 8$) of articles were published using qualitative approaches such as [54] open-ended interviews, bulletin board peers' discussion logs, research writing assignments, video and audio transcripts and observations notes [42], focus group interviews [55], case studies [56], and content analysis [13–15]. The most common qualitative methods used were case studies.

In addition, 30.952% ($n = 13$) of the examined publications showed that mixed-method techniques were more prevalent than qualitative ones. A questionnaire and a virtual, semi-structured interview were the most commonly used mixed methods. Other methods included the following: [45] a questionnaire and focus group interview, ref. [57] questionnaire and interview, [16] artificial intelligence sentiment analysis, [17] questionnaires and in-depth interviews, ref. [18] questionnaires and semi-structured interviews, [35] questionnaire and rubric, [58] face-to-face, open-ended interviews, bulletin board discussion logs, and online assessment projects, [41] surveys, instructor journals, and learning activities, [17] a questionnaire and case design, ref. [43] SRL activities, survey answer analysis, and journal reflection, and [59] content analysis and questionnaire. The different types of research methods used by the reviewed papers are shown in Figure 4.

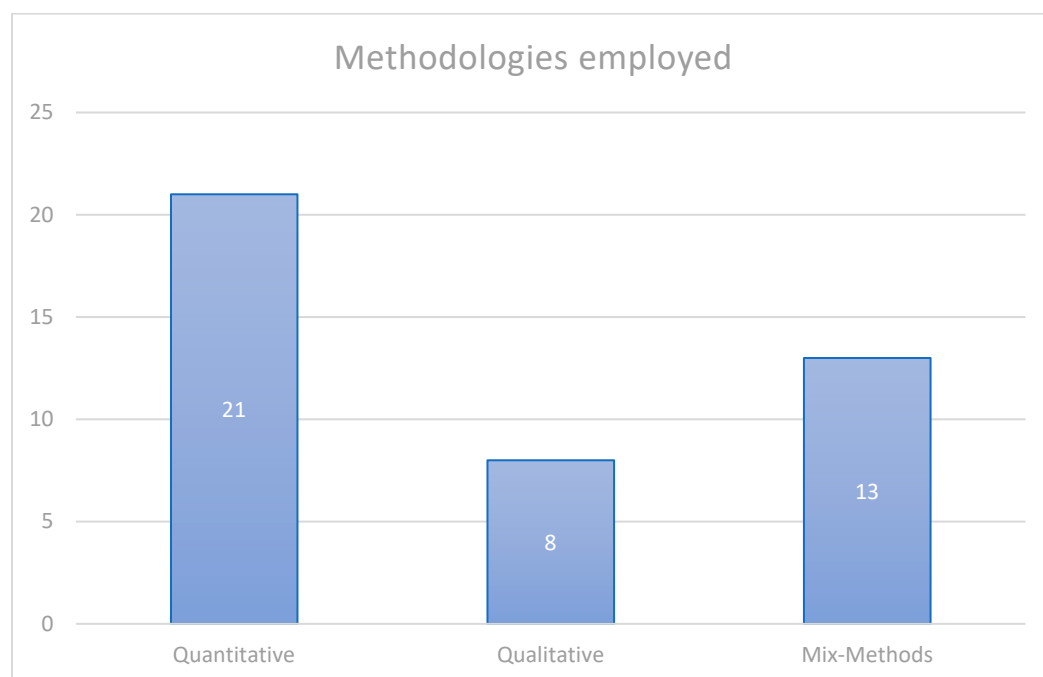


Figure 4. Methodologies employed.

4.5. Geographical Locations

The study on TDT in distance learning within the setting of universities is geographically diversified. Hence, there is no particular emphasis on places. There are, nevertheless, clear indications of high scientific activity in the US. A total of 18 articles [13,15,19,20,33,35,37,40–43,46,48,51,53,54,58] (42.857%) were carried out and published in the US. There have been just four investigations undertaken in Turkey [18,45,49,57], three in Malaysia [21,38,55], two in New Zealand [34,56], two in China [39,52], and two more in India [31,60]. Eleven papers were published globally in the interim, accounting for 25.3% of the articles examined. For example, the United Kingdom (n = 1), Thailand (n = 1), Sweden (n = 1), Hong Kong (n = 1), Greece (n = 1), South Africa (n = 1), Palestine (n = 1), Malawi (n = 1), the Philippines (n = 1), and Israel (n = 1), as well as a global study (n = 1). Therefore, nothing is known about TDT in African institutions' distance education programs. In the future, we suggest undertaking a further study, including Africa. Figure 5 depicts the geographical distribution of TDT and distance learning publications.

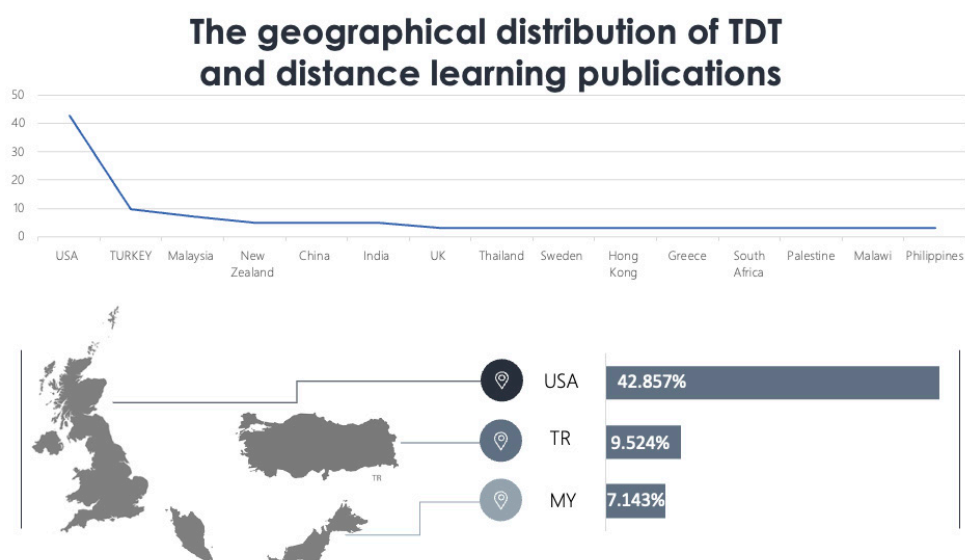


Figure 5. The geographical distribution of TDT and distance learning publications.

4.6. Future Agenda

Based on the analysis of the evaluated articles, the most common recommendation was that, firstly, the course design or structure must be based on theories and preceding literature to integrate distance learning [37–41,47–49]. Secondly, instructors have a crucial role in distance learning contexts by providing support and encouragement. Moreover, reasonable distance education tutors and advisors create a student-centered learning environment, care about students, and have subject understanding and basic technical abilities [50–54]. Another recommendation was that TDT is updated to reflect the use of synchronous technologies for remote learning, especially its definition and perspective on structural aspects and how synchrony impacts learner autonomy [56]. Finally, TDT promotes and facilitates distance learning. Instructional designers learn about distance learning and how to use technology in teaching and learning [15].

5. Discussion

There has been much use of TDT in the open, distance, and online education fields. Due to its widespread acceptance, TDT has been used in various educational institutions worldwide to understand distance learning better, create effective learning environments, and plan their implementation. There is a void in our understanding of where TDT is headed, how far it has come, and where we need to go next in terms of research when it comes to online education. Accordingly, this SLR seeks to grasp how TDT has improved our knowledge of remote learning situations. Based on this analysis, experts in the area would better understand where TDT is headed and be aware of research gaps that may be exploited to launch brand-new investigations.

5.1. Theory Integration

This SLR uncovered some fascinating and vital information. Most TDT research combines elements from other theories, as seen by the publications we analyzed. However, there seems to be a growing tendency to avoid combining TDT with different theoretical frameworks. Based on the examined sample, the integration of TDT with other theories was, for some reason, to explore some external factors that are missing in TDT; these factors are directly related to students in distance learning contexts, for instance, student satisfaction in distance learning contexts [16,41,46–49,57]. These studies concluded that distance learners' performance matches expectations, satisfaction increases, and interaction increases. Moreover, this integration was led by other factors like learners' academic achievement in distance learning contexts [9,38,42]. Another factor mentioned in the evaluated articles was students' anxiety in distance learning contexts [19].

Given that most of the examined articles integrated other theories into TDT, for instance, Bloom's taxonomy theory (BTT) [38], this study has addressed several factors, including the student's background, their experience, their collaboration, their satisfaction, their interaction, their autonomy, their academic achievements, their application, and their memory. Moreover, ref. [37] has integrated self-regulated learning (SRL). This study recommends that students complete exercises superficially, incorrectly, or not at all, due to a lack of discourse and structural features. The person–environment interaction model [39], on the other hand, addressed students' interaction, academic emotions, and learning persistence. The theory of mediated learning experiences (MLE) [40] addresses the technological environment, learning contents, communication with the teacher, communication between students, and the whole program. In addition, the integration between problem-based learning and computer-based scaffolds [35], which included Moore's TDT-informed computer-based scaffold, may foster group autonomy. The community of inquiry (CoI) [41] addressed structure, autonomy, and dialogue; student performance and satisfaction; and how teaching, cognitive, and social presence are included. Low structure,

conversation, and learner autonomy boosted student happiness. The rational analysis of mobile education (FRAME) [42] addressed student achievement, usability, student attitudes, and design principles. They highlighted that instructional designers should utilize TDT and FRAME to evaluate mobile learning studies. The social-cognitive theoretical framework [43] investigated communication and social interaction. Computer self-efficacy [19] studied anxiety and performance, revealing that face-to-face communication outperforms internet structure and innovation. The cognitive load theory, activity theory, and sociocultural theory [20] all looked at optimal learning environments, structure, and people's experiences. Furthermore, social science, cultural-historical, and activity theories [13] provide a social lens through which to view remote learning activities. Moreover, [38] discovered transactional distance, transactional control, shaping dwellings, and stigmergy, as they revealed that their work reinterprets TDT as transactional control.

Our suggestions based on this systematic analysis for future research in TDT in a distance learning context are anticipated to focus more on the integration of TDT with other theories and models, such as the technology acceptance model, to be able to investigate students' acceptance of the technology itself, along with their readiness and willingness to use it in their learning process.

5.2. Factors Related to TDT Should Be Included in Future Studies

TDT is a theory whose origins are determined by three significant factors: course structure, learner autonomy, and dialogue [1]. The theory's central aspect is the psychological need for autonomy, dialogue, communication, and the course itself [2]. Later, the theory was expanded to have three sub-factors under dialogue: learner-learner communication, learner-instructor communication, and learner-course (or technology) communication [6,7]. This resulted in various implementations of TDT in global research. Some studies identify course structure, learner autonomy, and dialogue as fundamental TDT components [15,31–36]. In addition to the essential, basic TDT components, research also appears to include students' satisfaction [16,41,46–49,57], learners' academic achievement [37–42,47–49], and students' anxiety in distance learning contexts [19].

Considering the articles we analyzed, we suggest that there is a lack of attention paid to the importance of students' "motivation" in distance learning. To address this issue, TDT must consolidate its many parts into one cohesive whole. It is considered that course structure, student autonomy, and dialogue are related to student motivation. For distance learning, all these factors must work together.

5.3. Type of Samples

Since TDT focuses on interpersonal and communicative processes, most relevant studies have included human participants. Most of the papers we studied used student participants in their studies. Different samples must be included in the study using a similar distance-learning setting. Students' perspectives and comments are crucial in distance education, but examples from lecturers and others who create courses for distance learners are equally valuable. There were no definitive conclusions concerning the future of research employing lecturers as samples in TDT in distance learning since just two reviews had been conducted. However, this information void might serve as a jumping-off point for further investigation and identifying new areas of study in TDT in distance learning contexts.

5.4. Research Techniques and Data Analysis

Among the different research methodologies used in our analysis, quantitative approaches predominate. New to our SLR is the inclusion of qualitative and mixed-method studies in our sample. These types of studies were not included in earlier reviews. This significant finding demonstrates that future research will concentrate on merging qualitative and quantitative data. Regarding statistical significance, the conclusion is in line with prior research. Structural equation modeling (SEM) is integral to quantitative analysis [39,49,53]. As a result, we believe that SEM will remain popular for at least the next decade. The availability of questionnaire-based instruments may explain the quantitative dominance since more straightforward statistical procedures such as factor analysis [38,51,52], regression analysis [57], correlation analysis [61], and MANOVA [18,40,57,61] are readily available. Statistical analysis agrees well with the results of these short surveys. Qualitative methods like thematic analysis [17,43,55,56] and content analysis [13–15,59] are still being considered.

We suggest qualitative and mixed approaches as the next step in research and a way to fill the knowledge gap left by the underuse of qualitative analysis.

5.5. Geographical Locations

Most of the evaluated studies took place in a developed Western economy. Consequently, we conclude that these nations' infrastructures allowed for the successful implementation of online education at the tertiary level. As a result, they worried less about issues like distance learning's general acceptability and ease of access. As a result, the consumers' motivating points of view are given the highest priority. Africa is under-explored compared to other locations like the United States and should be highlighted as a research need based on the selected publications. Since many developing countries in Asia have already conducted research on SDT in distance learning (Malaysia [21,38,55], the Philippines [32], and Thailand [34]), this area of study will likely continue to thrive in the region. The findings of studies undertaken in developed Asian economies, such as China [39,52], support this percentage.

5.6. Future Agenda

In our experience, assessments of upcoming works have been less carefully considered. The suggestions for future TDT research on distance learning point to a future emphasis on quantitative studies, such as using more extensive samples and quantitative research designs, including longitudinal, time-series, and experimental designs. Therefore, this lends credence to our claim that quantitative analysis, such as the SEM, would come to predominate in the field. It is telling that similar weight is attached to the idea that future research should focus on diverse cultural and geographical contexts.

6. Future Directions, Research Gaps and Research Recommendations

The theoretical integration, sample type, methodology, data analysis, location, and future development of TDT are all covered in this SLR. The following steps and research needs were identified based on a comprehensive and rigorous examination of 42 papers using PRISMA: the future agenda and research gaps are shown in Table 4.

Table 4. The TDT factors and TDT integrations utilized in the examined research.

Component	Future Agenda	Research Gap
Theory integration	Merging TDT with broader frameworks like the technology acceptance model.	There is a lack of studies looking at how TDT fits in with other frameworks.
TDT factors	Structure, discussion, learner autonomy, and external influences, as well as learner satisfaction and academic achievements, are all additional TDT components that should be included.	Lack of consideration for students' motivation to engage in distance learning and the entire range of TDT.
Sample type	Including a variety of lecturers and students as samples.	Other samples must be included for instance lectures, instructional designers, module creators, and faculty administrators.
Methodology approaches	Structural Equation Models are going to become the standard for analytical methods in the foreseeable future.	Methodological deficiencies may be attributed to the use of qualitative and mixed research approaches.
Geographical area	The US is becoming an increasingly important research destination.	The regions of Asia, Africa, South Africa, and Europe all need further research.
Recommendation and future work	A primary focus is on quantitative analysis as the research methodology of choice.	The employment of a variety of research designs, as well as time-series study designs, will contribute to the growth of methodological practices.

7. Limitations

Of the many types of research used in the chosen papers, quantitative techniques prevail. One of the limitations of this review was the language as only publications in English were selected; another limitation was the type of the publication since only articles were selected whereas books, blogs, and these were excluded. What makes our recent systematic evaluation of the literature unique is the rise of qualitative and mixed-methods research in the sampled studies, which was previously invisible in the archival literature. Compared to other research, this one is statistically right there with it. A large chunk of quantitative analysis involves using the structural equation model (SEM) method [39,49,53]. For this reason, we believe that SEM will remain popular for at least the next decade. Independent samples t-tests and Pearson correlations, among other less complicated statistical studies like factor analysis [38,51,52], regression analysis [57], correlation analysis [61], and multivariate analysis of variance [18,40,57,61], may also contribute to the quantitative predominance. These one- or two-choice surveys correlate well with numerical analyses. It is still possible to use qualitative methods like thematic analysis [17,43,55,56] or content analysis [13–15,59].

8. Conclusions

TDT is a foundational idea that has received much attention in distance learning. As the profile of online education grew, so did the need for additional data on its most recent developments, potential future avenues of inquiry, and existing knowledge gaps. This SLR evaluated the articles for their theoretical contribution, sample, data analysis, methodology, geographical focus, and prospects for further study. It is suggested that future research include TDT with other theories and models and involve professors or a mixed

sample of lecturers and students. Since the limitations of qualitative and mixed-methods research have not been fully explored, quantitative analyses like the structural equation model remain widely used. The scientific community may get a fuller and more nuanced understanding of TDT in distance education with the help of research undertaken on various continents, such as Africa and Asia. Future research might benefit from using experimental studies or mixed-methods designs to fill the knowledge gap.

This SLR summed up how TDT should be used with other future theories, including acceptance models like TAM. It is projected that TDT research will include a higher number of TDT elements, such as the level of students' desire for the context of remote learning. Future research in Asia, Africa, and Europe is expected to contribute to the global knowledge of TDT and its relevance to the context of remote education and the design of distance learning.

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Appendix A

Table A1. List of sampled articles.

Label	Article	Theories	TDT Factors	Sample	Research tool	Research approach	Analysis	Location	Recommendation and future work
A1	[44]	TDT	Structure, dialogue	Students	Questionnaire	Quantitative	Logistic regression modeling	Finland	Well-structured professor–student dialogue, internet access, and equipment enhance DL.
A2	[31]	TDT	Structure, dialogue, and learner Autonomy	Students	Questionnaire	Quantitative	Group comparison	India	By minimizing TD, enhanced variety, individualization, media consumption, and usability lead to students' flexible impression of better effectiveness.
A3	[32]	TDT	Structure, dialogue, and learner Autonomy	Students, faculty administrators	Questionnaire, and a virtual, semi-structured interview.	Mixed methods	Thematic analysis	Philippines	DL works better with low TD. Ideally, course structure, discourse, and student autonomy balance out.
A4	[45]	TDT	Dialogue (student–content,	Students	Questionnaire, and focus group interview	Mixed methods	Frequency, thematic analysis	Turkey	Minimizing TD includes making movies pupils can comprehend and study.

			student–in- terface, stu- dent–in- structor, and stu- dent–stu- dent interactions)						
A5	[46]	TDT	TDT and student sat- isfaction	Students	Question- naire	Quantitative	Pearson correlation	USA	Costly high-tech classrooms are not needed, which is good news for uni- versity budgets.
A6	[57]	TDT	Interaction and learner outcome interaction and out- comes in terms of learner characteris- tics, learner out- comes by in- teraction types, and factors in- fluencing interaction	Students	Question- naire and interview	Mixed methods	Independ- ent samples t- test, Pear- son corre- lation, and multivari- ate analy- sis of vari- ance (MANOV A), stepwise regression analysis, and constant compara- tive method	Turkey	Transactional dis- tance predicts learner learning and satisfaction.
A7	[38]	(TDT) and Bloom’s taxonomy theory (BTT).	Students’ background, students’ experience, students’ collabora- tion, students’ satisfaction. Students’ in- teraction, students’ autonomy, and aca- demic achieve- ments.	Students	Question- naire	Quantitative	Structural equation modeling (SEM) as well as confirma- tory factor analysis (CFA)	Malaysia	Course structure de- sign must be based on theories and pre- ceding literature to integrate online learning.

			Students' application, students' remembering						
A8	[33]	TDT	Structure, dialog, and learner autonomy	Lecturers	Reflective narratives. A review of evaluations of online lessons. Reflective journals	Quantitative	Collective self-study, systematic inquiry	USA	Flexibility is needed when constructing learning settings; instructors must scaffold for learners with low self-regulation while pushing autonomous learners.
A9	[34]	TDT	Structure, dialog, and learner autonomy	Students	Questionnaire, recorded video	Quantitative	Hypotheses testing	Thailand, New Zealand	TDT contributes fresh design expertise on discourse, course organization, and learner autonomy.
A10	[39]	TDT and person-environment interaction model	Students' interaction, academic emotions, and learning persistence	Students	Questionnaire	Quantitative	Structural equation modeling (SEM)	China	The research shows a link between student contact, academic feelings, and learning perseverance.
A11	[61]	TDT	Student performance, student attendance in synchronous and asynchronous learning activities, and student questions	Students	Online tools, namely ping pong, media site, and Adobe Connect)	Quantitative	Levene's test for equality of variances, independent sample t-test, and cross-correlation analysis	Sweden	TD oscillation between asynchronous and synchronous learning may polarise performance.
A12	[16]	TDT	Learners' satisfaction, learner autonomy, and the quality MOOC lessons	Students	Machine learning Sentiment analysis	Mixed methods	Predicting MOOC satisfaction	Hong Kong	Self-paced MOOCs' learner autonomy explains student happiness.
A13	[47]	TDT	Structure, dialog, and learner autonomy satisfaction	Students	Questionnaire	Quantitative	Descriptive statistics, mean score,	Greece	Tutors and educational institutions must enhance student–student

							standard deviation, t-test, ANOVA, and Spearman's rho criterion		contact in remote education programs.
A14	[50]	TDT	Interpersonal dialogue, course activities, interaction	Students	Questionnaire	Quantitative	Repeated measures, ANOVAs	World-wide	Students regarded tutors and instructors as helpful in language acquisition.
A15	[54]	TDT	Learning experiences, educational needs	Preservice teachers	Open-ended interview, bulletin board, peer discussion log, research, writing assignments	Qualitative	A constant comparative method, thematic ANALYSIS	USA	Instructors are encouraged to employ small-group (maximum five students) activity discussions in online courses.
A16	[40]	TDT, the theory of mediated learning experience (MLE)	Technological environment, learning contents, communication with the teacher, communication between students, whole program	Students	Questionnaires	Quantitative	MANOVA, means, and standard deviations	USA	Those that followed MLE had shorter transactional distances and a better result.
A17	[62]	TDT	Student support interventions, student retention, stimulating success, distance education, challenges in the competitive higher	Students, module coordinators	Questionnaires, in-depth interviews	Mixed methods	Thematic categorization, means	South Africa	Supports boost ODL's competitiveness, retention, and success rate.

education system									
A18	[18]	TDT	Perceptions of good tutors, good tutor characteristics	Students	Questionnaires, semi-structured interviews	Mixed methods	Pearson correlation, independent samples t-test, MANOVA	Turkey	Good distance education tutors and advisors create a student-centered learning environment, care about students, and have subject understanding and basic technical abilities.
A19	[35]	PBL, computer-based scaffolds TDT	Autonomy, dialogue, course structure	Students	Questionnaire Rubric	Mixed methods	Coding scheme, frequency counts	USA	Moore's TDT-informed computer-based scaffold may foster group autonomy.
A20	[21]	TDT	Communication practices, communication tools, and students' cognitive engagement	In-service teachers	Questionnaires	Quantitative	Factor analyses	Malaysia	Effective communication strategies and technologies boost remote learners' cognitive engagement.
A21	[58]	TDT	Rigors and flexibility in online course learning, peer feedback experiences, and video assessment analysis	Students	Face-to-face, open-ended interviews, bulletin board discussion logs, and online assessment projects	Mixed methods	constant comparative thematic analysis	USA	Lifespan motor development online coursework allows for individual learning methods and kinesthetic ideas.
A22	[9]	TDT	Student satisfaction, interaction, and collaboration, instructor support, and learning autonomy	Students	Achievement test questionnaires	Quantitative	Independent sample t-test, one-way ANOVA	Palestine	When student performance matches expectations, satisfaction and interaction increase.
A23	[41]	TDT community of inquiry	Structure, autonomy, dialogue, student	Students	Surveys, instructor journals, and	Mixed methods	Pearson correlation coefficient,	USA	Low structure, conversation, and learner autonomy

			performance and (b) student satisfaction; and (2) teaching, cognitive, and social presence		learning activities		students' comments analysis		boosted student happiness.
A24	[36]		Dialogue, structure, and learner autonomy	Students	Questionnaires	Quantitative	A Pearson product-moment correlation coefficient analysis	USA	High degrees of structure and discourse are not contradictory and have an inverse connection to TD.
A25	[60]	TDT	Course format, pedagogy involved	Students	A pre-test and a post-test quiz	Quantitative	A comparative study	India	Giving instructors the liberty and resources to decide on their objectives and how to accomplish them using technology may revolutionize any classroom environment.
A26	[17]	TDT	Background information, modes of instruction, and assessment, benefits of ODL, challenges faced	Students	A questionnaire a case design	Mixed methods	Frequencies and percentages, thematic analysis	Malawi	Increased access to excellent higher education, low tuition, and flexible payment are important advantages.
A27	[51]	TDT	Dialogue, structure, learner autonomy, and transactional distance	Students	Questionnaire	Developing new questionnaire	Exploratory factor analysis.	USA	The instrument is a valid and accurate measure of TDT structures.
A28	[49]	TDT	Interaction, structure, social presence, and satisfaction	Students	Questionnaire	Quantitative	Structural equation modeling (SEM)	Turkey	Course structure and Moore's TDT interaction aspects are negatively correlated.
A29	[42]	Rational analysis of mobile	Student achievement usability,	Students	Video and audio transcripts,	Qualitative	Transcripts analysis	USA	Instructional designers should utilize TDT and

		education (FRAME) TDT	student attitudes, design principles		observations notes				FRAME to evaluate mobile learning studies.
A30	[37]	TDT, self-regulated learning (SRL)	Dialogue structure self-regulated learning	Students, teachers	SRL activities, survey answers analysis, journal reflection	Mixed methods	Answers analysis journal reflection	USA	Students completed exercises superficially, incorrectly, or not at all due to a lack of discourse and structural features.
A31	[43]	TDT, social cognitive theoretical framework	Communicating, social interaction	Students	Questionnaire, discussion form	Mixed methods	Thematic analysis	USA	Online student research has perks.
A32	[55]	TDT	Interactions assistance autonomy	Students	Focus group interviews	Qualitative	Thematic analysis	Malaysia	In terms of usability, LMS is an excellent platform for material information and teacher feedback.
A33	[53]	TDT	Intention dialog, fit between course and technology, autonomy, ease-of-use, personal innovativeness with technology, learning style	Students	Questionnaires	Quantitative	Questionnaire development, the structural equation modeling technique	USA	This paper gives a foundation for TDT.
A34	[19]	Computer self-efficacy, TDT	TD, anxiety, performance	Students	Questionnaires	Quantitative	Partial least squares (PLS)	USA	Face-to-face dialogue trumps internet structure and innovation.
A35	[20]	Cognitive load theory, activity theory, sociocultural theory TDT	Optimal learning environment, structure, experience, and people	Student	Questionnaires	Quantitative	SEEP model for instructional design	USA	Using the SEEP approach to build blended learning courses for this population.
A36	[56]	TDT	Relationship	Student	Case study	Qualitative	Thematic analysis	New Zealand	TDT must be updated to reflect the

			formation, knowledge development, and communication of information						use of synchronous technologies for remote learning, especially its definition and perspective of structural aspects and how synchrony impacts learner autonomy.
A37	[15]	TDT	Structure, dialogue, and learner autonomy	Students	Content analysis	Qualitative	Content analysis	USA	This article may help open and distance learning instructional designers learn about mobile learning and how to utilize mobile technology in teaching and learning.
A38	[13]	TD with social science theory, cultural-historical theory, and activity theory	TD with social science theory, cultural-historical theory, and activity theory	Students	Content analysis	Qualitative	Case analysis	USA	A social perspective to view remote learning activities.
A39	[14]	Transactional distance, transactional control, shaping dwellings, stigmergy	Learner control, transactional distance, instructor control	Students	Content analysis	Qualitative	Theory, description	UK	This work reinterprets TDT as transactional control.
A40	[48]	TDT	Course format, structure, and opportunities for interaction, and satisfaction	Students	Questionnaire	Quantitative	Frequencies, descriptive statistics, and histograms	USA	Learners' interactions contributed to their perceived knowledge increase.
A41	[59]	TDT	Verbal dialogue and nonverbal interactions	Lecturers'	Content analysis Questionnaire	Mixed methods	Comparison of means and standard deviations,	Israel	Data-based formative assessment helps instructors regulate cross-context changes by using verbal and

						MANOVA , and content analysis	nonverbal tactics to minimize transac- tional distance in a DL setting.	
A42	[52]	TDT	Instructor— learner, learner— learner, learner—con- tent, and learner—in- terface	Students	Question- naire	Explora- tory factor analysis	China	Web-based teaching courses must ad- dress TDT factors.

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