We are IntechOpen,
the world's leading publisher of
Open Access books
Built by scientists, for scientists

4,800
Open access books available

122,000
International authors and editors

135M
Downloads

Our authors are among the

154
Countries delivered to

TOP 1%
most cited scientists

12.2%
Contributors from top 500 universities

BOOK CITATION INDEX
CLARIVATE ANALYTICS
INDEXED

WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com

Transactional Distance Theory: A Critical View of the Theoretical and Pedagogical Underpinnings of E-Learning

Laura Delgaty

Abstract

This chapter provides a critical look at the literature surrounding Distance Education and targets Transactional Distance Theory. It will examine in detail the three components: structure, interaction (or dialogue) and autonomy. The structure necessary for successful distance learning starts the chapter. Next, interaction (or dialogue) is introduced and the complexity of this in relation to the student experience is discussed. Finally, autonomy is explored in detail. This overview will relate specifically to the student perspective. Alternative approaches, links to seminal authors and a critical viewpoint is taken throughout.

Keywords: transactional distance theory, autonomy, structure, interaction

> *'Theories Such as Transactional Distance Theory Are Invaluable in Guiding the Complex Practice of a Rational Process Such as Teaching and Learning at a Distance'* ([1], p. 3).

1. Introduction

Within this chapter, the objective is:
To review literature on the theoretical and pedagogical underpinnings of distance education, specifically transactional distance theory and the concepts of structure, interaction and autonomy.

1.1 Search strategies

Data bases were searched including: Scopus, Psychinfo, Web of Knowledge, Medline ERIC and CINAHL to identify potentially relevant material using the following terms:
(Effective or successful or valuable or useful) and (DL or distance learning or computer assisted learning or e-learning or elearning or online learning or online education or distance education or technology enhanced learning or computer mediated learning or computer based learning or ICT).
In Scopus alone, this wielded over 9000 results consisting of:

- work on effective DL investigating specific media or resources;

- undergraduate education;

- editorial and opinion papers;

- comparative studies (i.e. to traditional face to face teaching);

- systematic reviews (few);

- K-12 education;

- an abundance of 'how-to' books;

- reams of advocacy papers and success stories; and

- anecdotal and promotional articles.

The choice of databases reflected the heterogeneous nature of the research in the area of technology, education, and social sciences. Unless reviewing theoretical literature (learning or organisational theories), only technological literature published in the last 10 years was reviewed. Striving to strike a balance between comprehensiveness (or sensitivity) and precision this date restriction was chosen which is common practice in literature reviews. This time frame appears to be congruent with other literature reviews in this area including: 9 years [2] and 8 years [3]. The focus was specifically on higher education and online courses if possible (for example, excluded blended learning). Both synchronous and asynchronous delivery, were included. Abstracts of all identified papers were read and full copies of articles that appeared relevant were saved as electronic files in endnote. Duplicates were deleted. E-books, books and photocopied chapters of traditional books were used and organised manually by topics. Citation searches were done on all articles that related directly to transactional distance theory or reviews of DL. Searches were limited to English language books and journals.

1.2 Overview

Distance education was first introduced into mainstream lexicon in the 1970s [4]. There were early attempts to define it, and controversies around what it actually was. One of the barriers (and 40 years on, the most revolutionary argument for me) was basically this: Is distance education a geographic separation of learners and teachers, or a pedagogical concept? Moore suggested the latter. He developed Transactional Distance Theory (TDT) in an attempt to demonstrate and explain that distance education was more concerned with pedagogy than geography [4, 5].

1.3 Results

In 1973, Moore initially defined TDT as a psychological and communications gap that was a function of the interplay of *structure,* and *dialogue.* It was the cognitive space between teachers and students that must be crossed yet was a place of potential misunderstanding between the teacher and the learner. This space was continuous, relative and never exactly the same. Ideally, this distance or space needed to be minimised or shortened. Even in traditional education there was transactional distance and therefore the actual theory was a subset, albeit specialised, of conventional

teaching and learning, [6]. However, in DL, due to the unique environment teachers and learners experienced more of a distance due to the physical distance (and if asynchronous, time) that separated these two groups. Therefore, transactional distance theory, more specifically, the transactional distance between teacher and learner was potentially more problematic at a distance and may have contributed to students' feelings of isolation, reduced motivation and engagement and eventually attrition in early DL [5]. Moore originally suggested that developers of DL must consider two variables that affect transactional distance: structure and dialogue [4]. Structure was the rigidity or flexibility of the instructional methods and strategies whilst dialogue referred to the interaction between the instructor and learner during a DL experience. Transactional distance was a function of dialogue and structure. With less dialogue and more structure, the transactional distance was higher (**Figure 1**).

In a course with little transactional distance, learners have guidance through ongoing dialogue [7]. This would be more appropriate, or attractive to learners who were less secure in managing their own learning. Moore later recognised with minimal dialogue, students were forced to make their own decisions for themselves and generally exercise autonomy [5]. Working with Kearsley, he later identified three interactive components or constructs [8] that needed to be considered to shorten the transactional distance and provide a meaningful learning experience for students. These included the original two:

- structure of the instructional programs;

- dialogue or interaction between learners and teachers and the new addition; and

- autonomy or the nature and degree of self-directedness of the learner.

This third hypothesised factor, autonomy, interacted with both structure and dialogue and the three together formed a model or theory [9] for understanding online learning [8] (**Figure 2**).

Structure was determined by the actual design of the activity, how the instruction was organised and the use of different media communications [8]. Dialogue could be synchronous, asynchronous and dialogue that was internalised within the student. Learner autonomy related to the individual learner's self-directedness or sense of personal responsibility. There appeared to be a relationship between structure, dialogue and autonomy. The greater the autonomy, the less teacher control
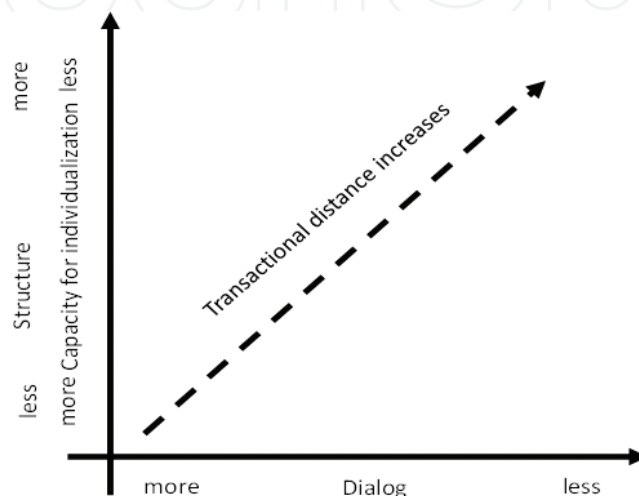
Figure 1.
Relationship of structure and dialogue to transactional distance [4].
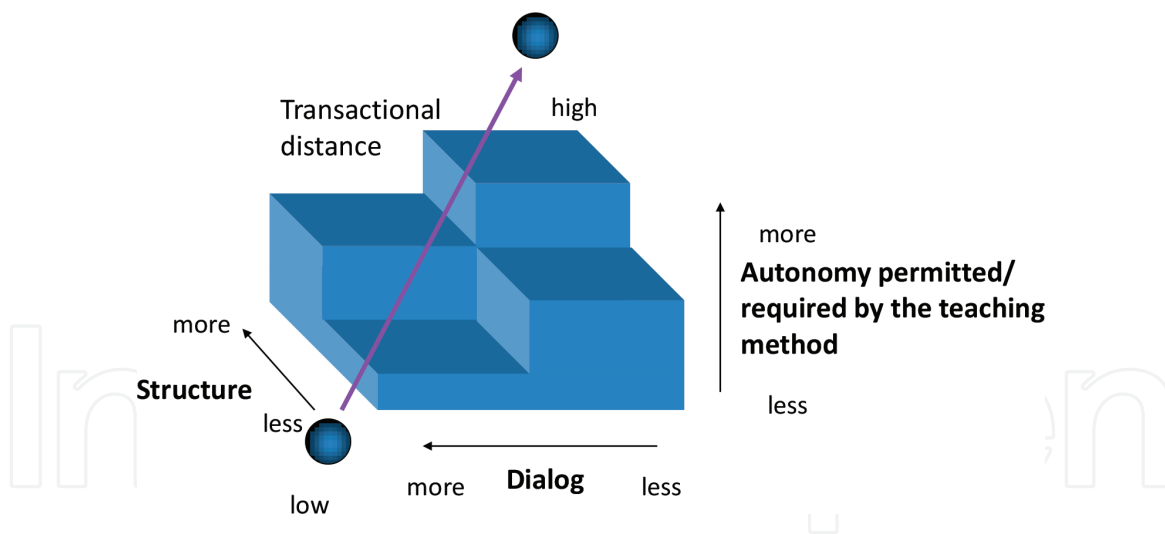
Figure 2.
Overview of transactional distance theory (3D model).

there needed to be to decrease the transactional distance and have a successful distance module. Conversely, with less dialogue and more structure, the likelihood of an increased transactional distance, which in turn led to less successful online programmes, was greater [10]. Successful distance environments depended on the teacher providing opportunities for dialogue and 'appropriately' [10] structured learning materials. This became extremely complex. Identifying the level of structure required, facilitating dialogue and encouraging individual learner autonomy was demanding and multifaceted as the greater the structure and the lower the dialogue, the more autonomy the student must demonstrate.

1.3.1 Deweyian link

These three complex factors relate to Dewey's seminal work. He suggested the educational process is a collaborative reconstruction of experience and has two sides: one psychological (cognitive) and one sociological. He warned that neither could be subordinated to the other or neglected without consequence.

Dialogue or interaction between learners and teachers: Dialogue, and engaging in interaction forces individuals to construct ideas in a deep learning sense [7]. Dewey [11] supported this constructivist approach to learning. He discussed the need to support learners' in their construction of meaning and argued only through social interaction and interaction with the environment could the learner construct conceptualisations and find solutions. He reasoned that through interpersonal, instructional dialogue the learner gains advantages in the pursuit of knowledge and understanding.

Structure of the instructional programs: Dewey described the function of education as improving the reasoning process [12]. Based on active experience, the role of the educator was to shape experience and structure the environment to promote experiences leading to growth. This role was one of a guide, or facilitator encouraging creative interaction and emphasising the development of solving problems and discovering knowledge. These higher order activities are encompassed in Dewey's practical inquiry model which includes four phases: triggering event, exploration, integration and resolution.

Autonomy or the nature and degree of self-directedness of the learner: Autonomy, the third factor in TDT is reflected in constructivist views encouraging active, collaborative and responsible learners [13]. The genesis of self-directed learning can be attributed to Dewey [7] who suggested that autonomy helped create the conditions that encourage individuals to exercise initiative, reflection and choice [11].

1.4 A critical view of transactional distance theory

Many researchers [1, 14–16] identified transactional distance as important and viewed TDT and as a basic analytical framework for understanding distance education systems.

'Transactional distance theory provides a useful conceptual framework for defining and understanding distance education in general and as a source of research hypotheses more specifically' ([14], p. 527).

Despite considerable time span over which this theory has evolved, there are critics and little empirical research has been carried out to test the validity and relationships of the constructs [16, 17].

TDT has been investigated from different perspectives. Two studies were found using questionnaires as data collection tools [18, 19]. Bischoff *et al.* were interested in student perceptions of transactional distance, structure and dialogue [18]. Transactional distance, dialogue and structure were all related to certain 'items' (in reality questions). Each variable was then measured using data generated from fixed questionnaire. Transactional distance was measured by two items, dialogue by one item and structure by three. The results supported Moore's theory showing dialogue and transactional distances were inversely proportional. However, dialogue (a complex variable) was measured by only one item, there was no discussion of quality of dialogue (only quantity) and the actual items being measured were not clearly defined.

In an attempt to investigate TDT further and create a clear connection between dialogue, structure and autonomy as they related to learning outcomes, 121 learners were part of a study in a DL environment [19]. Operational definitions were given and they looked at dialogue in terms of frequency and occurrence, structure in terms of delivery and implementation and autonomy in terms of personal ratings of independence. These variables were compared to student's self-assessment. The results found only two variables had significant effects on perceived learning outcomes: the greater the perceived transactional distance, the lower the perceived outcomes and the greater the frequency of discussion, the higher the perceived achievement of learning outcomes. The results support Moore's theory, although as in [18] a simple questionnaire was used, data was collected only once and dialogue was measured only by frequency.

Two articles were found addressing TDT that measured observable behaviour as opposed to student perceptions [20, 21]. Data was collected on 30 interactions between instructors and learners and measured behaviours using the 'systems dynamic model' [21]. Verbal behaviour was measured using a discourse analysis and, combined this with a measure of 'structure' of the programme then identified the variance. By measuring the rate of instructor and learner control, this variance (the ratio between amount of dialogue and extent of structure) was the transactional distance. The results demonstrated that transactional distance varied with dialogue and structure. As dialogue increased, distance decreased; as structure increased, transactional distance increased. This model produced values for transactional distance consistent with Moore's theory and suggested that transactional distance was directly proportional to dialogue and inversely proportional to structure. Although this supported Moore, the quantification of dialogue and structure of a programme was problematic to me. They looked only at one-to-one synchronous communications between learner and teacher. Therefore, the generality of the study is limited and it is hardly representative of the majority of DL trends. The effects of change in structure on dialogue was investigated during an audio-conferenced course [20]. Only structure and dialogue were compared. Over 100 students participated and dialogue was measured in frequency and duration whilst structure was defined by one aspect of instructional design (question asking

behaviour of instructor). In support of TDT, different types of interactions and questions appeared to determine learner participation. According to the authors, of the four experimental procedures one was cancelled and one was biased. The instrument for measuring interaction was not shown to be reliable, the samples were not clearly described and the grouping unclear. Again, dialogue was measured in terms of frequency and duration. However, the results suggested that certain types of question-asking behaviour by the instructor could predict dialogue in the student [20]. The authors claimed that both structure and dialogue were important to success and by increasing dialogue and structure, one could increase student participation and decrease transactional distance.

Two articles were found [22, 23], from very different perspectives, using questionnaires to explore influences of variables in DL and presenting conflicting results. The effects of course format, satisfaction and perceived knowledge gained were examined during an online programme. Satisfaction was broken down into different aspects to relate to the constructs set out by Moore in TDT. A questionnaire was used and the instrument was described. A very low response rate (17%) was not explained, however, there did appear to be a relationship between course design and satisfaction. The more satisfied the learners were with the structure and with interaction, the more satisfied they were with their perceived knowledge gained. This supported Moore's assertion that structure needed to be appropriate for the learner and that low structure and high dialogue could lessen transactional distance. An interesting article, publishing negative findings investigated the impact of individual and instructional variables on 71 (87% return rate) learner's perceived transactional distance [22]. Once again, questionnaires were used to measure student perceptions (on a 23 item sliding scale) and results analysed against four variables. The results did show a high ratio of certain variables to perceived transactional distance. Although peripheral, their findings also included that neither face to face interaction during an online course or previous experience changed transactional distance. Interestingly, some of the results suggested a negative effect between transactional distance and 'online tutoring' or interaction although 'online tutoring' was not clearly described. Content validity of the survey was addressed in that 'experts' and 'educationalists' reviewed the tool and there was a high response rate. The conclusions were that alternative measures of transactional distance (qualitative, observation, interviews) would help understand these phenomena. Predominantly published literature was biased towards positive results [24], so this article was a valuable alternative perspective.

In 2009, a review classifying 695 articles on DL was carried out. The focus was to identify gaps and priority areas in DL research. A consensus of 25 experts reviewed research published between 2000 and 2008 [3]. The method and results were clearly described and this was one of the only DL reviews found that included non-English journals. (One of the criticisms of distance education reviews is the focus on 'peer reviewed' English language journals [2]). Fifteen main research areas and strong imbalances were described. They found research 'dreadfully neglected' on organisational change and development, costs and faculty support. These are all addressed in this submission and in my own review. However, closely related to TDT, they identified an imbalance with over 50% of all articles focusing on:

- instructional design;

- interaction and communication in learner communities; and

- learner characteristics (including motivation and autonomy).

Although not highlighted by the authors of this review, these corresponded directly with Moore's three components of TDT. Admittedly, TDT appears to be a descriptive, rather that predictive theory, but there is a clear collaboration with outcome variables [9]. Furthermore, Moore's concept of transactional distance was a significant paradigm shift for educationalists as it grounded the concept of distance in distance education in a social science framework and not in its usual physical science interpretations [7]. Whether there are strong empirical studies supporting Moore's theory or not, it is evident his three components continue to be a priority in research [2, 3, 16].

1.5 Summary of research on TDT

- TDT had roots in humanistic and behavioural ideologies.

- Structure and dialogue were the initial factors in Moore's [4] TDT theory and a third factor, autonomy was later added [8].

- Structure, dialogue and autonomy were related, dynamic and necessary, in successful distance education [8].

- Moore did not define any of the constructs operationally [17], which has led to lack of clarity in follow up research.

- Studies investigating the complex constructs of autonomy and self-directedness using closed questionnaires and scales were common.

- The majority of published work investigating TDT has been approached from a positivist paradigm looking for correlation and statistically significant relationships between complex concepts (for example, autonomy and perceived learning outcomes).

- None of the studies found supported or totally negated the proposition of transactional distance.

- All of the studies reviewed suggested that future research into this area should include interview or observational data [18–22, 25].

2. Student experience: structure or design

'*Educators must recognise that poorly designed educational programs...are not improved by being presented on a Web page*' ([26], p. s87).

2.1 Introduction

This section of the literature review addresses the three component parts of TDT separately.

2.2 Results

Formal 'instructional design' (ID) models, a systematic approach for developing educational products, used liberally when designing web-based courses at the University level [16, 27] all contained a number of key elements or components and

have been widely adapted in e-learning [28]. The four core components of ID as they related to educational programmes are found in **Table 1** [29]:

Various models have adapted ID, but they are based on the desire to provide guidance to designers as they aim to develop effective and consistent educational solutions on a reliable basis [27, 28]. One of the most popular [30] and best documented models [31] was ADDIE, comprised of five stages of instructional design: analysis, design, development, implementation and evaluation. The ADDIE model specifically [31–33] and ID in general [27, 29, 30, 34, 35] have been researched intensely relating education to technology. This systematic approach to ID provides an empirical and replicable process when developing learning materials [31, 33].

2.2.1 A critical view of instructional design

Although there was a plethora of research suggesting these models were the clear way to structure DL, there were critics as well. Much of what is termed 'e-learning' was still based on the recursive decomposition of knowledge and skill principles of ID [28]. The supporters of rigid ID tended to be training organisations with a training philosophy whose intellectual base consisted of principles derived from behaviourism and associationism [28]. A well-known and published author in the field of ID in America, looked critically at four different 'tools' based on ID, including the ADDIE model. He critiqued all four for their expertise required, lack of collaborative learning, lack of authenticity and linear nature [32].

2.2.2 Structure or instructional design and transactional distance theory

Instructional design seemed uniquely poised to bridge the knowledge gap in the provision of DL by identifying what historically had been done in education and describing new directions in course design and structure [7]. This gap in knowledge relative to course design was especially applicable in the area of medical and allied health education [27]. Forty years ago, Moore prophetically discussed design or structure as being imperative in successful DL environments [4]. In 2010, design was addressed again and it was suggested it was an ideal term to use as it bridged both theory and practice [36]. Using surveys only, the structural factors affecting DL were investigated focusing on satisfaction, assessment of learning outcomes and perceived achievement of learning outcomes [37, 38]. 38,000 students taking 264 online courses in New York, were studied, analysing course documents and student questionnaires (38% return rate) [37]. In another study, 21 online courses were investigated using expert reviews of learning designs and student perception surveys [38] . Both studies demonstrated a correlation between greater structural consistency within the course, student satisfaction and perceived learning, used at least two methods of data collection and multiple raters for analysis of the data. However, the persistent attempt to quantify and measure people's perceptions of satisfaction and perceived learning is questionable given the complex nature of these constructs.

Components of instructional design
• Analysing the problem
• Designing a solution
• Implementing the solution
• Evaluating the degree of success of the solution

Table 1.
Core components of instructional design relating to educational programmes.

Regardless, students were more satisfied with courses that had defined structure and they felt they had learned more than totally open and flexible courses.

In a study using closed question surveys followed by interviews, data was collected data from 76 students who were asked to identify either challenges or useful components to their online experience [39]. The students were all undertaking a full degree using different technologies and structures, *yet al*l from a distance. The closed response questions were followed by nine semi-structured interviews. Two researchers conducted the interviews and data was thematically analysed and used to substantiate and extend earlier results from the questionnaire. The results suggested (89%) that the design of the course was the most important component of a successful e-learning experience [39] which supported the necessity and importance of instructional design, regardless of the mode of delivery. The sample size was small; the response rate of the survey was not given, nor was the relationship of the interviewees to the students. However, this is one of the few studies using mixed methods that have approached instructional design and student learning or satisfaction from a less positivist approach. Multiple sources of data collection were used which may have allowed researchers to validate and crosscheck findings [40].

Two studies both investigated structure in relationship to student satisfaction and perceived learning [23, 41]. One surveyed 6088 (31% return rate) DL students in New York and compared levels of structure and instructional design to student satisfaction [41]. The other surveyed 201 (17% response rate) learners in a Midwestern American University comparing levels of satisfaction with structure and design, satisfaction and perceived knowledge gained [23]. Both of these studies used closed questions and rating scales, the questions were not clear to the reader and the response rates were low. However, in both studies, the central role of structure and student satisfaction or perceived knowledge gained was supported.

In one of the few studies specifically addressing context, Benson and Samarawickrema [42] compared six case studies of 'successful' DL initiatives in Australia. Definitions and programmes were clarified and their focus was to illustrate how e-learning designs (specifically those using Web 2.0 technologies) were instrumental in increasing success and decreasing transactional distance. With a practical focus and rich contextual description, these cases suggested that by carefully structuring and designing a course, transactional distance can be decreased. They also highlighted that design must be variable and provide a clear strategy for an analytic approach that is responsive to both the learners and the context of their learning.

2.3 Summary of research on instructional design or structure

Formal instructional design, in its prescriptive and inflexible sense was the basis for most early DL initiatives. Although when subscribing to a learner centred perspective this seems problematic, more progressive models have been developed incorporating constructivist and interactive approaches to planning DL. The amount and type of structure necessary appears to be inconsistent. However, there does appear to be a relationship between the level of structure and student satisfaction and an increase in perceived learning.

Originally, ID was developed to emphasise 'learning by doing' with immediate feedback on success, careful analysis and atomisation of learning outcomes and above all aligning these learning outcomes with instructional strategies and methods to assess the learning outcomes.

The ID approach to e-learning has become widely, yet perhaps unfairly discredited [28]. This may be due to the fact that a number of terms and expressions are

used synonymously with ID and although the basis is behaviourism, or a teacher centred model, this is often an unfair association [43].

Many models that are labelled as 'constructivist' are indistinguishable from those derived from the associationist perspective [28].

Recently ID and general DL structure has moved towards creativity and interaction and away from low-level immediate responses [34].

Empirical and case study literature has repeatedly explored the relationship between (a) structure or design and (b) student satisfaction, transactional distance and learning.

There appears to be a close relationship between (a) structure and (b) transactional distance, student satisfaction and increase in perceived learning.

3. Student experience: interaction and communication

Learners interact with their environment ([7], p. 15).

3.1 Introduction

The published research on DL is abundant, however, the actual student experiences have gone relatively undocumented [44, 45] and are not fully understood [46]. The challenge was to understand, students' use of technology to support higher-order learning, interaction and dialogue [7]. The second factor contributing to an understanding of TDT was interaction, communication or dialogue and is the focus of this section.

3.2 Results

Communication, interaction and support from faculty and peers is consistently rated as having a major influence on DL [16, 39, 47–53]. However, our understanding of its use is seriously limited [7] by empirical research which has used rating scales and closed questionnaires to explore perceived support and perceived learning. With the exception of two papers, the papers above investigated student satisfaction and barriers or facilitators to DL [51, 52]. They were not directly focused on interaction or dialogue; they were exploring experiences generically. One paper specifically nurses' experiences. The findings supported the other studies; the interaction between the instructor and student, or student to student, was highlighted as integral to a positive learning experience or improved outcome [53].

A highly respected and well published five stage model illustrating online interaction or engagement (**Figure 3**) is found below [54].

This model is used as the basis for analysing and describing how the teacher or 'e-moderator' could support student learning. Other models and conversational frameworks of analysing online discourse [55–57] followed a relatively similar pattern of generating ideas, increasing interaction and information exchange followed by divergent thinking and development. These models have been criticised as being artificial, prescriptive and based on personal experience, not empirical research [9]. Salmon's work specifically has been criticised for its focus on the advancement of individual practitioners and the lack of attention paid to leadership and the institution as a whole. Successful initiatives must be scaffolded by dialogue and promote interaction and participation [54].

As discussed, the majority of the literature included interaction as one of the several factors affecting success in DL. A small amount of literature was found that addressed interaction, dialogue or engagement specifically.
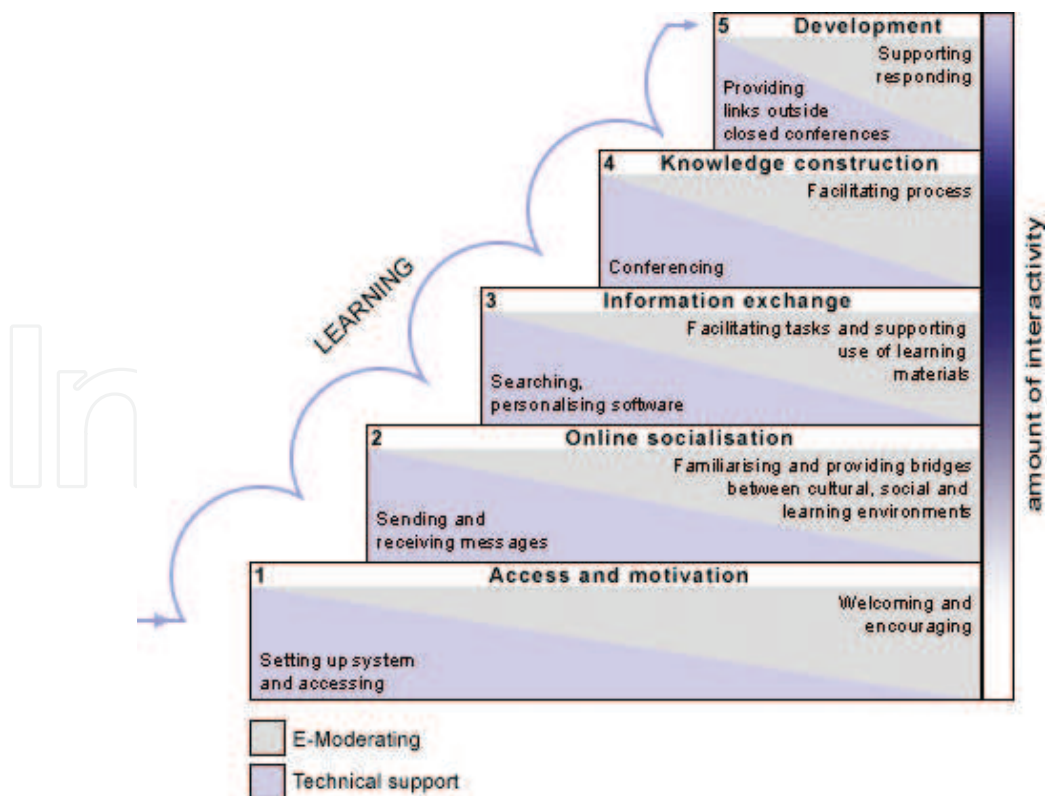
Figure 3.
Salmon's [54] five stage model of online learning and teaching (p. 29).

3.2.1 Learner-learner and instructor-learner dialogue

Learner-learner and instructor-learner dialogue was the focus in a study of 38,000 students taking 264 online courses in New York [37]. Course documents and student questionnaires (38% return rate) were analysed. Student perceptions were explored based on learning, interaction with instructor and classmates, and personal level of activity. She found significant correlations with student satisfaction and interaction with the instructor (r = 0.761, p = 0.01) and perceived learning (r = 0.707, p = 0.01). There were also significant correlations between interactions with other students and course satisfaction (r = 0.440, p = 0.01) and perceived learning learned (r = 0.437, p = 0.01). Her findings appeared consistent with the literature in that interaction with instructor and amongst peers was consistently associated with the success of online courses [37]. Although this study was supported by research in a similar vein [7], there were some fundamental issues that were problematic. The survey consisted of multiple-choice and forced-answer questions investigating the 'dimensions' of satisfaction and perceived learning with no explanation as to how these questions were developed. There was no explanation for this quantitative attempt to measure the complex nature of satisfaction and learning.

3.2.2 Instructor-learner dialogue

Instructor-learner dialogue, specifically, examining the relationships between verbal immediacy and affective and cognitive learning in DL was explored. 145 post-graduate students involved in an asynchronous online course were surveyed using a questionnaire based on several verbal immediacy scales (described in detail) and both cognitive and affective learning scales [58]. The verbal immediacy scale consisted of 20 statements concerning instructor behaviour, the affective learning scale six dimensions and the cognitive learning scale was designed to produce a measure of learning loss. The hypothesis of correlation between instructor

immediacy and affective learning was supported (r = 0.73, p < 0.01). The hypothesis of positive correlation between instructor immediacy and cognitive learning was supported (r = .054, p < 0.01). The verbal immediacy scale was based on other scales developed in a traditional face to face environment, yet the use of them in a non –traditional asynchronous environment was not justified. These students were all studying humanities and may not represent other post graduates as their requirement for instructor interaction may be unique. Regardless, the conclusion included a positive relationship between instructor immediacy and affective learning. Students who rated their instructors as more verbally immediate expressed improved affective and cognitive learning. Although immediacy of feedback was part of the original aim, it was not the focus for review. The majority of the literature found investigated the value and necessity of speed in asynchronous interactions. Learner-learner and instructor-learner interaction has been shown to be effective in creating successful DL environments, but what has become key is timely interactions [7]. Timely interaction related to Moore's [4] concept of TDT. This psychological separation was an interaction between levels of dialogue and levels of structure or autonomy. Therefore, the greater, and faster, and more involved the level of interaction or dialogue was, the lower the level of psychological feeling of separation there would be [7]. Timeliness of interactions, frequency, occurrence, type of interaction and immediacy are all areas that need to be examined more in distance education research [7].

3.2.3 Learner-learner dialogue

Learner-learner interaction is essential [10]. Two recent studies were found specifically addressing collaboration and peer interaction on performance in DL. One investigated social performance in computer supported collaborative learning [51], while another [52] analysed participants' experiences thematically in web conferences. In the first study, 39 undergraduate students were assigned to groups with either specialised collaborative activities and structure or none [51]. Data was collected on group performance using self and peer assessments and a rating scale for both behaviour and performance. These terms were all defined, although the rating scales were not validated or transparent. The group exposed to the specialised collaborative activities demonstrated a perceived increase in team development, ability to deal with team conflict and a more positive attitude towards collaborative problem solving [51]. The second study explored dialogue relating to learning in participants undertaking web conferences on leadership. Using data from two series of online seminars lasting over a year, the authors analysed all recorded 'text chat' data using thematic analysis. Validity was addressed by making the analysis process transparent, the analysis itself was done by three researchers and the final data was compared to the literature. Themes identified relating to learning were: social interaction, information giving, internalisation, co-construction of knowledge and multi-process learning. The results of both of these studies suggest that online activities that promote learner-learner interaction are important for effective team performance and collaborative learning [51, 52].

3.3 Alternative approaches

Adults, as learners, need to see relevance or usefulness in their learning activities [59]. Therefore, these learners needed to see how interacting with their peers would benefit them and have relevance to their learning. Two slightly eclectic

studies were found that addressed this from alternative viewpoints. One of the few longitudinal studies within this entire review followed groups of adult learners over 15 years [60]. This three-stage ethnographic-action research study tracked learners and their learning community at a virtual university in Australia as they undertook a Masters of Arts degree. The cycles, agents of change and staged findings were well explained. Conclusions suggested peer dialogue provided the mechanism for deep learning experiences and a sense of community. They related their findings to Bandura [61] suggesting that a community of learning requires:

- relevance-social and situational;

- involvement-reflective action and interpretive practice;

- technology-enabling and self-efficacy with ICT; and

- acceptance-recognition by peers.

The aim of this interpretive study was to explore how post-graduates could be guided to create conditions for effective peer discourse. In order to understand this, a study using traditional scientific methods would be inappropriate. Of the four concepts listed as necessary, the social relevance or usefulness appeared to play the biggest role to students. This study was not addressing whether group interaction was valuable but what conditions were necessary for it to occur and be valuable for students. Supporting these findings, but from an alternative angle, a case study was presented in which the interaction between learners was a failure [62]. This empirical positivist study used a questionnaire survey and statistical analysis addressing several hypotheses of why students did not participate in an online discussion forum at a University in West London. Hypotheses included low level of usage was due to either: attitudes of the student, low perceived usefulness of discussion board or technological complexity. The results from the 24 questions showed statistically significant results in that low perceived usefulness of the discussion board was the primary cause for its failure. The questionnaire consisted of scaled questions only and the development of the tool itself was not discussed. Although not made explicit, it appears that only 10% of the potential students completed the questionnaire. However, the conclusions support another study [60] that usefulness or relevance is necessary for successful learner-learner interactions. The approach to present findings of an unsuccessful initiative was unique. One of the general biases with published materials is the possibility of publication bias where negative studies are unpublished [24].

3.4 Summary of research on dialogue and interaction

- Interaction or dialogue was clearly related to student satisfaction and perceived learning whilst relevance, usefulness and immediacy of interactions appeared to be the most integral issues in decreasing TD and contributing to successful DL environments.

- Interaction/dialogue/engagement were terms used simultaneously in the literature and there were three different divisions: instructor-learner, learner-learner and learner-content.

- Literature overwhelmingly suggested that learner-instructor and learner-learner interaction was important to student satisfaction and the facilitation of learning [16, 39, 47–53].

- Online 'community' or collaboration was an important variable in online classes. Without this online discourse online courses became a mere transmission of information.

- Several frameworks for designing and analysing interaction in DL were found all aimed at student's progression into higher levels of thinking [54–57].

- E-moderators took on multiple roles: they moderated or facilitated discussion, answered emails and managed the flow of content or responses. Their presence and immediacy impacted on student satisfaction.

- Students required usefulness, value or relevance in online interaction or discussion for it to be adopted successfully.

- The roles that interaction and dialogue play in DL is not well understood Moore (1973) warned this area should not be underestimated and argued no other area of study will have a greater impact on the future of distance education.

4. Student experience: autonomy

4.1 Introduction

A hallmark of DL has been its reliance on learner autonomy [63] which was the third hypothesised element of TDT [8] and the focus of this section.

4.2 Results

Literature addressing autonomy in DL, unlike structure or dialogue which was relatively straightforward, was complex and multi-faceted [1]. Major reviews were found discussing autonomy in learning [64] and specifically autonomy in DL [4, 10]. In a review of autonomy and learning, literature was investigated over the last two decades, describing various definitions, and highlighting inconsistencies in the literature [64]. The review was divided into topics; however, there was no explanation as to search criteria or strategies. Autonomy was defined in terms of a redistribution of power concerning the construction of knowledge and the roles of participants. Although, DL was not addressed explicitly, the paper claimed autonomy was '...*a departure from education as a social process*' (p. 116). Over 2000 pieces of literature concerning autonomy were reviewed [4]. This visionary work (pre-internet!) explained '*The autonomous learner is not to be thought of as an intellectual Robinson Crusoe, castaway and shut-off in self sufficiency*' ([4], p. 669).

In a later review, research on autonomous learning was reviewed [7] and further, explained that there were two dimensions of autonomy in DL: self-management of pedagogy and self-monitoring of cognition, or metacognition. Both cognitive autonomy and taking responsibility for one's learning were essential. Focusing on the meta-cognitive aspects of learner autonomy, strategies were compared in classroom vs. DL [65]. Using questionnaires followed by verbal reports, the relationship was explored between autonomy and the instructional

context of distance learners (n = 274) or classroom learners (n = 143) in a language programme. Variant analysis was applied to the questionnaire data to determine the relationship between learning strategies and context. The results showed that mode of study (distance vs. traditional) was the principal influence of the relationship between students and autonomy (more so than age, level etc.). Distance learners made greater use of metacognitive strategies than classroom learners, especially relating to self-management. A further analysis was done using verbal reports (n = 37) and the data was classified from the transcripts by the researcher and an independent rater. A total of 836 instances of strategies relating to autonomous work were identified. The average instance of strategy use from distance learners was 26.6 whilst a traditional student was 10.2. Instances of using metacognitive strategies in classroom learners was on average four, whilst distance learners reported an average of 15. The results suggested distance learners used more metacognitive strategies than classroom learners [65]. Critically, the numbers in the two groups were uneven and the development of the questions was not well described. However, the dual nature of the study, independent raters, transparency of inter-rater reliability and clear analysis suggested rigour. This study suggested that learners either approach DL with, or develop very quickly, metacognitive and self-management skills.

In a later study, metacognitive knowledge was investigated and experiences in distance education [66]. Thirty one students were interviewed focusing on a model of metacognitive knowledge comprising self, task, strategy and goals. Content analysis was used to identify categories of metacognitive experiences. There was an average of 19.7 instances of metacognitive knowledge per student and in descending order, the four dimensions of metacognition were: self-knowledge, strategy knowledge, task knowledge and knowledge of goals. Each student was able to recount at least one instance of a metacognitive experience. Conclusions included: students appeared to have experienced some, often extremely memorable, metacognitive experiences and metacognitive knowledge of distance students appeared to be primarily about self and strategy and less about tasks and goals. However, these dimensions were highly interactive and not distinct. The quantification of a complex concept such as metacognition, and the suggestion that students can identify a 'metacognitive experience' suggested a positivist approach to a subject containing multiple realties. However, the author attempted rigour in that the methods were clearly explained, two raters were used, and transcripts were revisited for further analysis with discussion to resolve differences. Overall, the metacognitive aspect of autonomy seemed to be occurring and seemed to be important in these student's DL experiences [66]. Knowledge about oneself and strategies were more important for successful learning than knowledge about tasks and goals. This perhaps, suggested that self-monitoring is one of the keys to autonomy in DL.

Another study investigated how DL students conceptualised the three elements in TDT: structure, dialogue and autonomy [67]. Using a pre-tested and piloted questionnaire, 169 distance education students (72% response rate) were surveyed. Learner autonomy was measured by students indicating which of 11 statements described themselves (i.e. able to learn without lots of guidance, able to develop a personal plan, able to find resources, self-directed, prefer learning in a group, need collaborative learning). The results were analysed using factor analysis and suggested a two-factor solution: independence and interdependence. Independence accounted for 29% of the total variance with a Cronbach's alpha of 0.82. Interdependence (interpersonal, interactive aspects) accounted for 26% of total variance with a Cronbach's alpha of 0.77. The results suggested that the concepts of dialogue, structure and autonomy were complex and that students tended to

describe themselves as both independent and interdependent. The lack of correlation also suggested these features of autonomy were essential, but separate and distinct attributes. Although the attempt to quantify with statistical analysis something as complex as autonomy was fundamentally flawed, this study provided a particularly interesting idea: an individual's autonomy as a distance learner should be understood as including their abilities to work with others, or be interdependent. Autonomy is multi-faceted and interdependence appeared to be essential. These results suggested that there may be an attempt to move beyond the focus of independence in this environment and move towards 'interdependence'. Other) earlier findings support this 'personal control' [68]. It is suggested successful adult learners demonstrated appropriate dependency needs when participating in DL including: help, approval and support, leadership of others and sharing efforts and responsibility.

4.3 Summary of research on autonomy

- Autonomy or self-directedness has been a core feature of adult learning for years and closely relates to TDT. DL, when considered as a social process relates to this complex construct. Autonomy has been described as both self-management of pedagogy and metacognition. Furthermore, to 'traditional' autonomy, has been added 'interdependence' in group activities in DL.

- Moore and Kearsley (1997) suggested autonomy, a third factor in TDT, influenced and interacted with dialogue and structure in transactional distance.

- Self-directed learning/autonomy/independent learning were all used with a considerable degree of equivalence in the literature and became popularised in the 1970s.

- Literature appeared to focus on measuring autonomy and relationships of factors within TDT, attempting to quantify and compare a complex subject using statistical analysis and were often lacking a theoretical framework.

- There appeared to be varying perspectives concerning autonomy and independence vs. interdependence. I disagreed with Thanasoulas [64] that autonomy was a departure from education as a social process. I supported Moore [4], Garland [68] and Chen and Willits [67]. An individual's ability to work online in groups was essential.

- Individual autonomy has been classified as self-management of pedagogy and metacognition. Both of these appeared to be important and occurring in DL. Studies exploring these involved constructs have attempted to quantify these complex subjects.

- Studies that have compared the different dimensions of autonomy suggested knowledge about oneself and self-strategies were more important than knowledge about tasks and goals, yet students must manage both 'academic' learning and the process of learning.

Author details

Laura Delgaty
Medical Education, Newcastle University, England

*Address all correspondence to: l.e.delgaty@ncl.ac.uk

IntechOpen

References

[1] Garrison R. Theoretical challenges for distance education in the 21st century: A shift from structural to transactional issues. The International Review of Research in Open and Distance Learning. 2000;**1**(1):1492-3831

[2] Berge ZL, Mrozowski S. Review of research in distance education, 1990 to 1999. American Journal of Distance Education. 2001;**15**(3):5-19

[3] Zawacki-Richter O. Research areas in distance education: A Delphi study. The International Review of Research in Open and Distance Learning. 2009;**10**(3):1-17

[4] Moore M. Towards a theroy of independent learning and teaching. Journal of Higher Education Policy and Management. 1973;**44**(9):661-679

[5] Moore M. Distance education theory. The American Journal of Distance Education. 1991;**5**(3):1-8

[6] Lowe W. Transactional distance theory as a foundation for developing innovative and reactive instruction. Educational Technology and Society. 2000;**3**(1):1-3

[7] Moore MG, Anderson WG. Handbook of Distance Education. 2nd ed. Mahwah, New Jersey: Lawrence Erlbaum; 2007

[8] Moore MG, Kearsley G. Distance Education: A Systems View of Online Learning. 3rd ed. Belmont, California: Library of Congress; 2012

[9] Wallace RM. Online learning in higher education: A review of research on interactions among teachers and students. Education, Communication and Information. 2003;**3**(2):241-280

[10] Moore MG. Theory of transactional distance. In: Keegan D, editor. Theoretical

Principles of Distance Education. London: Routledge; 1997. pp. 22-38

[11] Dewey J. Democracy and Education. Middlesex: Echo Library; 2007

[12] Dewey J. The essential Dewey volume 1. In: Hickman LA, Alexander TM, editors. Pragmatism, Education, Democracy. Bloomington: Indiana University Press; 1998

[13] Tam M. Constructivism, instructional design, and technology: Implications for transforming distance learning. Educational Technology and Society. 2000;**3**(2):50-60

[14] Jung I. Building a theoretical framework of web-based instruction in the context of distance education. British Journal of Educational Technology. 2001;**32**(5):525-534

[15] Collins MP, Murphy KL. Development of communication conventions in instructional electronic chats. Journal of Distance Education. 1997;**12**(1):177-200

[16] Goel L, Zhang P, Templeton M. Transactional distance revisited: Bridging face and empirical validity. Computers in Human Behavior. 2012;**28**(4):1122-1129

[17] Gorsky P, Caspi A. A critical analysis of transactional distance theory. The Quarterly Review of Distance Education. 2005;**6**(1):1-11

[18] Bischoff WR et al. Transactional distance and interactive television in the distance education of health professionals. American Journal of Distance Education. 1996;**10**(3):4-19

[19] Chen YJ, Willits FK. A path analysis of the concepts in Moore's theory of transactional distance in a videoconferencing environment.

Journal of Distance Education. 1998;**13**(2):51-65

[20] Bunker E et al. A study of transactional distance in an international audioconferencing course. Proceedings of Seventh International Conference of the Society for Information Technology and Teacher Education Phoenix. 1996. pp. 40-44

[21] Saba F, Shearer RL. Verifying key theoretical concepts in a dynamic model of distance education. American Journal of Distance Education. 1994;**8**(1):36-59

[22] Chen YJ. Transactional distance in World Wide Web learning environments. Innovations in Education and Teaching International. 2001;**38**(4):327-338

[23] Stein DS et al. Bridging the transactional distance gap in online learning environments. American Journal of Distance Education. 2005;**19**(2):105-118

[24] Cook DA et al. Internet-based learning in the health professions. The Journal of the American Medical Association. 2008;**300**(10):1181-1196

[25] Kanuka H, Collett D, Caswell C. University instructor perceptions of the use of asynchronous text-based discussion in distance courses. American Journal of Distance Education. 2002;**16**(3):151-167

[26] Chumley-Jones HS, Dobbie A, Alford CL. Web-based learning: Sound educational method or hype? A review of the evaluation literature. Academic Medicine. 2002;**77**(10):s86-s93

[27] Joiner RC, Adkins MAC, McLenighan HX. Social Support Tools in Allied Health Online Instruction, in School of Education. Ann Arbor, Michigan: Capella University; 2008

[28] Beetham H, Sharpe R. Rethinking Pedagogy for a Digital Age. London: Routledge; 2010

[29] Smith P, Ragan T. Instructional Design. 3rd ed. New York: Wiley Publishing; 2005

[30] Ipek I, Izciler M, Baturay MH. New Trends and Approaches in Instructional Design and Technology: From Schools to Industry, in International Educational Technology Conference. Eskisehir, Turkey: Anadolu University; 2008

[31] Dick W, Carey L. The Systematic Design of Instruction. New York: Scott, Foresman and Company; 1985

[32] Gustafson K. Instructional design tools: A critique and projections for the future. Educational Technology Research and Development. 2002;**50**(4):59-66

[33] Dick WC, Carey L, Carey J. The Systematic Design of Instruction. 6th ed. Boston: Pearson/Allyn and Bacon; 2005

[34] Morrison GR et al. Designing Effective Instruction. Danvers, MA: John Wiley and Sons; 2011

[35] Koksal MS. An instructional design model to teach nature of science. Asia-Pacific Forum on Science Learning and Teaching. 2009;**10**(2):1-23

[36] Beetham H, Sharpe R. Rethinking Pedagogy for a Digital Age. London: Routledge; 2007

[37] Swan K. Building learning communities in online courses: The importance of interaction. Education, Communication and Information. 2002;**2**(1):23-49

[38] McNaught C, Lam P, Cheng K. Investigating relationships between features of learning designs and student learning outcomes. Educational Technology Research and Development. 2012;**60**(2):271-286

[39] Song L et al. Improving online learning: Student perceptions of

useful and challenging characteristics. The Internet and Higher Education. 2004;**7**(1):59-70

[40] Patton M. Qualitative Research and Evaluation Methods. New York: Sage Publications; 2002

[41] Shea PJ, Pickett AM, Pelz WE. A follow-up investigation of "teaching presence" in the SUNY Learning Network. Journal of Asynchronous Learning Networks. 2003;**7**(2):61-80

[42] Benson R, Samarawickrema G. Addressing the context of e-learning: Using transactional distance theory to inform design. Distance Education. 2009;**30**(1):5-21

[43] Wilson BG, Myers KM. Situated cognition in theoretical and practical context. Theoretical Foundations of Learning Environments. 2000. January 2012

[44] Cook D. Where are we with web-based based learning in medical education? Medical Teacher. 2006;**28**(7):594-598

[45] Alexander S. E-learning developments and experiences. Education and Training. 2001;**43**(4/5):240-248

[46] Moule P. Challenging the five-stage model for e-learning: A new approach. Association for Learning Technology Journal. 2007;**15**(1):37-50

[47] Hill JR et al. Exploring research on internet-based learning: From infrastructure to interactions. In: Jonassen DH, editor. Handbook of Research on Educational Communications and Technology. Mahwah: Lawrence Erlbaum Associates; 2003. pp. 433-460

[48] Hermans C, Haytko D, Mott-Stenerson B. Student satisfaction in web-enhanced learning environments. Journal of Instructional Pedagogies. 2009;**1**:1-19

[49] Ituma A. An evaluation of students' perceptions and engagement with e-learning components in a campus based university. Active Learning in Higher Education. 2011;**12**(1):57

[50] Mason R, Weller M. Factors affecting students' satisfaction on a web course. Australian Journal of Educational Technology. 2000;**16**(2):173-200

[51] Phielix C, Prins FJ, Kirschner PA. Awareness of group performance in a CSCL-environment: Effects of peer feedback and reflection. Computers in Human Behavior. 2010;**26**(2):151-161

[52] Seddon K et al. Towards an understanding of the learning processes that occur in synchronous online seminars for the professional development of experienced educators. Education and Information Technologies. 2011;**17**(4):431-449

[53] Moule P, Ward R, Lockyer L. Nursing and healthcare students' experiences and use of e-learning in higher education. Journal of Advanced Nursing. 2010;**66**(12):2785-2795

[54] Salmon G. E-Moderating—The Key to Teaching and Learning Online. Abington, Oxon: Routledge Falmer; 2008

[55] Gunawardena CN, Lowe CA, Anderson T. Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. Journal of Educational Computing Research. 1997;**17**(4):397-431

[56] Harasim L. Shift happens: Online education as a new paradigm in learning. The Internet and Higher Education. 2000;**3**(1-2):41-61

[57] Laurillard D. Rethinking University Teaching: A Conversational Framework

for the Effective Use of Learning Technologies. New York: Routledge Falmer; 2002

[58] Baker J. An investigation of relationships among instructor immediacy and affective and cognitive learning in the online classroom. The Internet and Higher Education. 2004;**7**(1):1-13

[59] Knowles MS. The Adult Learner: A Neglected Species. Oxford: Gulf Publishing; 1978

[60] Eustace K. Building an effective online learning community: An ethnographic study. Communications in Computer and Information Science. 2011;**177**:226-242

[61] Bandura A. Social cognitive theory in cultural context. Applied Psychology. 2002;**51**(2):269-290

[62] Lee H, Kim JW, Hackney R. Knowledge hoarding and user acceptance of online discussion board systems in e-learning: A case study. Computers in Human Behavior. 2011;**27**(4):1431-1437

[63] West RE. Insights from research on distance education learners, learning, and learner support. American Journal of Distance Education. 2011;**25**(3):135-151

[64] Thanasoulas D. Autonomy and learning: An epistemological approach. Applied Semiotics Journal. 2000;**4**(10):115-132

[65] White C. Autonomy and strategy use in distance foreign language learning: Research findings. System. 1995;**23**(2):207-221

[66] White CJ. The metacognitive knowledge of distance learners. Open Learning: The Journal of Open, Distance and e-Learning. 1999;**14**(3): 37-46

[67] Chen YJ, Willits FK. Dimensions of educational transactions in a videoconferencing learning environment. American Journal of Distance Education. 1999;**13**(1):45-59

[68] Garland MR. The adult need for "personal control" provides a cogent guiding concept for distance education. Journal of Distance Education. 1994;**9**(1):45-59