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The interaction factor as a challenge for foreign language learning in the technology based education: a pedagogical reflection

The author carries out a pedagogical reflection on how the technology driven distance learning repeatedly neglects the scientific achievements of Second Language Acquisition and Language Pedagogy. Seeing communicative competence as a major goal of a language classroom, she presents the main challenges that the communicative approach poses to distance learning. To this end, a general distance learning theory by Moore is adapted to the needs of language education, through a distinction between three aspects of learner interaction – with the teacher, with other learners and with content. In this three-dimensional paradigm the learner is seen as the main actor of the process, the teacher as a facilitator, the text as a main source of communicative data and the learner autonomy as the fundament of the process.

Key words: distance language learning, communicative approach, communicative competence, interaction, e-learning, technology-based learning, learner autonomy, transactional distance theory, interaction with text, teacher-learner collaboration.

1. Introduction

The aim of this article is to underline some of the challenges that the technology-based distance learning poses to the communicative approach to language learning (LL) and, at the same time, to show how a general distance education theory – an interaction oriented one – may be adapted to the field. The author of this paper refers to *learning* and not *teaching* processes as a central concept, for two reasons. Firstly, she regards the learner-centered education as an appropriate approach to language education, seeing the instructor in the role of *facilitator* and not *knowledge provider* and the development of communicative competence as an individualized process that cannot be submitted to top-down management. She also considers that the shift to distance education (and, simultaneously, to a technology-based education) is a process that somehow obligates academics, educators, teachers and learners to reexamine the role of the learner, because the use of distance systems requires new kinds of interaction different than those of the traditional classroom¹. Learning at distance definitely will

¹ Kramsch has shared a similar observation stating already in 1993 that “computer schooling, new schooling is constructivist, non-linear, learner-oriented”. See: C. Kramsch, *Context and Culture in Language Teaching*, Oxford

not guarantee the development of learner's autonomy or learning literacy, but it does create an opportunity to reconsider a new context for "taking charge of one's own learning"².

For the purpose of this study, the author chose a constructivist approach to language learning and limited the research field to distance learning (DL) situations that take place entirely in a virtual classroom. In these circumstances the physical separation of the learner and the teacher is permanent, which significantly affects the pedagogical dynamics, as distinguished from *b-learning* or *computer assisted learning*, which also include real-life interactions. In the hereby observation, the author has chosen *interaction* as a factor that is, at the same time, pedagogically fundamental (according to both second language acquisition and language education studies) and technologically challenging. To carry out this reflection, several online LL systems were examined: including one MOOC, two Moodle platforms, several YouTube channels and numerous devices presented in the EDUCA 20th International Conference on Technology Supported Learning and Training (Berlin, 2014). The selected systems were dedicated to basic levels (A1-B1) and can be classified as online distance learning with various forms of asynchronous interaction.

2. Challenges of the technology-driven distance education – from education in general to foreign language learning

Given the fact that DL is becoming economically more profitable than traditional face-to-face learning, new tendencies in education have been and will continue to appear: a truth well known to education and business sector. A problem that rises is that these trends are frequently technology-driven and the pedagogical aspects play a secondary role, a concern that may be summarized by Rheingold's "first pedagogy, then technology" appeal³. Literature and learning environments observations show that what has been studied for decades about learning and cognitive processes is often neglected in virtual environments. As Mikropoulus states:

"(...) distance learning generations are "technology driven, with their features to emerge directly from the type of the technology used. Only in the last two generations some pedagogic characteristics appear, such as real time interaction, collaboration and learner-centered education. Again, these issues originate from technological solutions. There are no pedagogic principles that technology serves; rather technology drives the pedagogic principle"⁴.

Mioduser, based on a research on over 400 educational websites, makes an overall evaluation of "one step ahead for the technology, two steps back for the pedagogy", advocating collaboration between pedagogues in the creation of DL environments⁵. In turn, Mikropoulus reports that even researchers in the field do not focus enough on pedagogic issues such as

1993, p. 201.

² H. Holec, *Autonomy and Foreign Language Learning*, Oxford 1981, p. 3.

³ H. Rheingold, *Keynote speech. Before technology: pedagogy*, EDUCA Conference, Berlin, 3rd December 2014.

⁴ T.A. Mikropoulus, "On the Pedagogy of Open and Distance Learning Systems", 2013, pp. 1–2, http://earthlab.uoi.gr/earthlab_files/articles/ODLPedagogy.pdf [9.03.2015], p. 1.

⁵ D. Mioduser, R. Nachmias, A. Oren, O. Lahav, "Web-based learning environments (WBLE): Current implementation and evolving trends", *Journal of Network and Computer Applications*, 22, 1999, p. 236, as quoted by Mikropoulus, op.cit., p. 2.

interaction⁶. Some examples of non-implementation of pedagogical principles, relevant to the present study are the deficit of interaction and major focus on the material⁷ rather than on the learner or learning itself. However, not only technological challenges create obstacles for the development of learning principles. Tennenbaum reveals a “lack of knowledge of [constructivist] principles by the instructional designers and educators”⁸. All this brings us to a conclusion that modern DL creators concentrate on how to make the system and its material presentation technologically attractive, rather than on effective learning, similarly to the traditional teacher-based education used to focus erroneously on teacher’s and not the learner’s performance.

The thesis of this paper (unquestionable to scientists, but apparently not implemented in practice) is that web designers must acknowledge academic accomplishments⁹ – in the case of language learning this will be the field of second language acquisition (SLA) or language education (LE), as independent disciplines – alongside the fact that the principles of learning and acquiring languages differ from those belonging to other learning domains. Therefore, some of the basic LL principles – in many cases contingent, though, with those of general education – that cannot be omitted are: the communicative approach, task-based learning, learner autonomy and strategy training, meaningful learning and focus on meaning, balanced treatment of learners input and output and an integrated development of the five basic communicative skills¹⁰. These principles seem to have been implemented in numerous offline environments (textbooks, school programs, official documents) – a positive phenomenon particularly visible for dominant or “booming” languages such as Spanish and English – which is why their deficit in e-learning environments seems disturbing.

3. Interaction as a key factor in foreign language learning and the transactional distance theory

As already stated, language acquisition is guided by particular cognitive processes, which creates the need for adapting a general distance learning education theory to the LL education. Within an inspiring frame of reference, Moore¹¹ proposed distinguishing the following kinds of interaction: with content, with the instructor and with other students. To adjust this three-dimensional paradigm to our purposes – studying learner’s interaction as a key component of LL – we ought to take communicative competence as the main final outcome, learner autonomy as the fundament of the process, and the constructivist approach to language learning. In consequence, the main interactional aspects of LL will turn out to be, to a great extent, compatible with Moore’s model.

⁶ T.A. Mikropoulos, op.cit. p. 1.

⁷ T. Govindasamy, “Successful implementation of e-Learning Pedagogical considerations”, *Internet and Higher Education*, 4, 2002, pp. 287-299, as quoted by Mikropoulos, op.cit. p. 8.

⁸ G. Tennenbaum, S. Naidu, O. Jegede, J. Austin, “Constructivist Pedagogy in Conventional on-Campus and Distance Learning Practice: An Exploratory Investigation”, *Learning and Instruction*, 11, 2001, p. 108.

⁹ Compare with: T. Govindasamy, op.cit. p. 7.

¹⁰ Compare with: R. Ellis, “Principles of Instructed Language Learning”, *The Asian EFL Journal Quarterly*, 7 (3), 2005; D. Nunan, *Task-Based Language Teaching*, Cambridge 2004, p. 1-16.

¹¹ M.G. Moore, “Three types of interaction”, *American Journal of Distance Education*, 3 (2), 1989.

3.1. Peer-to-peer interaction in the communicative approach

Three basic assumptions regarding this first interactional dimension in the communicative approach need to be highlighted. Firstly, communication is the basic means and a final goal of classroom interaction: That is to say, if interaction between learners is recommended for other subjects, in case of FLL it is absolutely indispensable. Secondly, interaction should involve oral as well as written discourse (taking as well into account the hybrid forms of modern communication technologies like chat or SMS) and, thirdly, interaction has to be achieved between the learners and only in the second place with the teacher, who takes on the role of facilitator that moderates, rather than dominates, communication.

It can be affirmed that not all of the new technologies enable the learners to interact with each other in a truly communicative way. On the contrary, some of them present the content in such a way that makes the process practically contradictory to the rules of communicative approach (an example may be using videos to present vocabulary as a final goal, instead of working on the video comprehension as a real-life skill). This leads us to one of the two problems that should be underlined on that subject, which is the predominance of the grammar and vocabulary approach. The observed Moodle and MOOC platforms base the learning process on a formal syllabus where grammatical and vocabulary issues are presented separately from the communicative content. As Madrid and García Sánchez state, “the proponents of the notional-functional syllabus (...) put a great deal of emphasis on contextualization. Teaching and learning activities must be based on meaningful contexts, since meaning merges from context”¹², which show the dominant, formal approach as highly defective in contrast to the recommended notional-functional one.

Secondly, in the studied environments, communication (if occurs) is limited almost entirely to listening and reading skills, leaving very little room for learner’s oral or written production and ignoring the significance of output and interaction in the learning process. A general concern expressed by Volery, as quoted by Mikropoulus, is that students interact “only with technology and not with other students or the instructor”¹³, which bring us to a conclusion that a different model must be implemented to LL. One of the solutions, a technological one, would be an inclusion of interactional tools to support interactive learning and communication, such as e-mail, text chat, collaboration tools, video conferencing and messaging software, as proposed by Wong¹⁴.

¹² D. Madrid, E. García Sánchez, “Content-Based Second Language Teaching”, in: E. García Sánchez (ed.), *Present and Future Trends in TEFL*, Almería 2001, p. 114.

¹³ T. Volery, “Online education: an exploratory study into success factors”, *Journal of Educational Computing Research*, 24 (1), 2001, pp. 77-92 as quoted by T.A. Mikropoulus, op.cit. p. 10.

¹⁴ C.J. Wong, “Selecting Internet Technologies to Support Interactive Teaching and Learning at a Distance”, in: B. Collis, R. Oliver (eds.), *Proceedings of ED-MEDIA 99 World Conference on Educational Multimedia, Hypermedia & Telecommunications*, Seattle 1999, pp. 1881-1882, as quoted by Mikropoulus, op.cit., p. 8.

3.2. Interaction with text as a context for communicative competence development

In his theory, Moore alludes to “interaction with learning content”¹⁵, which, given the specific character of language as *content* in LL, requires specifying. It is evident that it is the *text* that constitutes the essential component of learning *material* from the point of view of psycholinguistics¹⁶. It is true as well that “only when learners are engaged in decoding and encoding messages in the context of actual acts of communication are the conditions created for acquisition to take place”¹⁷. The text, as a basic source of information for the learner, may be written or oral, provided in traditional education mainly by the textbook, the teacher and classroom interaction. The learner in language classroom interacts with text as input: a learning substance and a main source of linguistic communicative data¹⁸. Nevertheless, in a wider sense, the content to learn available to the learner includes also formal linguistic support which would be: instructions, tables, diverse activities. This text *sensu largo* actually can be considered as linguistic input if available in the foreign language. In any case, in the communicative approach, text as a means of authentic oral or written communication is inseparable from the learning content. To learn a language and build the communicative competence, the learner has to interact with text; a process that creates knowledge.

Contrary to that, online courses seem to present or *serve* information about linguistic subsystems (e.g. personal pronouns, articles) separated from text, or through an uploaded video in which an instructor explains how the present tense works. Whereas, according to the bases of SLA, the acquisition takes place through interaction with input, the predominance of a *transmission* approach results in an unreflective assimilation, incompatible with the goals of developing learner autonomous communicative learning. The alternative is a learning based on learner’s reflection and discovery, for instance, through inductive grammar or vocabulary teaching. Information giving is not the main role of the teacher anymore – a truth long known in SLA and LE. Defenders of such communicative concepts, as *whole language theory* and *interpretive teaching* have favored a constructivist and interactive ways of learning for years¹⁹, which allow the learner to make hypotheses about the text or vocabulary meaning and discover rules by him/herself. Although still mainly on a declarative level, online education seems to lean toward the same conclusion. An example may be a distinction between *Xmoocs* based on an expert content transmission and *Cmoocs* relying on knowledge sharing within the community.

A second challenge regarding interaction with the learning material, though connected with the transmission approach problem, is the role of meaningful learning in the construction of knowledge, or in a broader perspective, of competence. Meaningful learning is a process of connecting new information, in a non-arbitrary and substantive (non-verbatim) manner, with

¹⁵ M.G. Moore, op.cit., p. 2.

¹⁶ M. Dakowska, *Psycholingwistyczne podstawy dydaktyki języków obcych*, Warszawa 2001, pp. 81-88.

¹⁷ R. Ellis, op.cit. p. 3.

¹⁸ S. Krashen, “The Input Hypothesis: An Update” in: J.E. Alatis (ed.), *Linguistics and Language Pedagogy: The State of the Art*, Georgetown 1991, pp. 409-431.

¹⁹ D. Madrid, E. García Sánchez, op.cit. p. 124.

the background knowledge possessed by the learner²⁰. In a traditional classroom, there seem to be more opportunities to determine and activate the learner's background knowledge or to influence in her/his interaction with the content by making it more meaningful. The online learning systems seem not to be flexible enough to modify the learning content on the spot according to the learner's background knowledge about a specific topic or linguistic content²¹. One of the recommended activities, but difficult to apply technologically would be dealing with strategies that help constructing knowledge, based on the previous one, as a key element in reading comprehension²². Online designers must recognize the fact that in the constructivist perspective knowledge does not exist as separate from learners: they are actively engaged in creating it.

The fact that knowledge and skills construction takes place in communication, through creating pragmatic meaning, again leads us to the need of involving the learners in oral or written text production and not only comprehension. As Ellis explains, "in arguing the need for a focus on pragmatic meaning, theorists do so not just because they see this as a means of activating the linguistic resources that have been developed by other means, but because they see it as the principal means by which the linguistic resources themselves are created"²³. Additionally, the same author is convinced that "engaging learners in activities where they are focused on creating pragmatic meaning is intrinsically motivating"²⁴.

To ensure that the interaction with text is communicatively effective, it should be multifaceted, i.e. it ought to "support students in their use of all aspects of language; [with students learning] about reading and writing while listening and about writing from reading and gaining insights about reading from writing"²⁵. Another criterion for texts as learning content is their authenticity²⁶. Unfortunately online learning is plentiful of grammar and vocabulary driven dialogues and other non-authentic texts. To give an example, in one of the e-learning platforms we can find a dialog that seems hardly imaginable in a real-life communication: the purpose of speakers communicative acts remains obscure (and subdue to the goal of presenting the formal content such as: days of the week, future tense and numbers) and the learners role in creating meaning is not specified as they are asked to "listen to the dialogue and (...) "notice whether you can already pick up common words and phrases", a tendency dominant in the whole course.

"On which days will you have classes?
I'll have classes two days a week. On Mondays and Thursdays.
Monday afternoons?
No, Monday evenings. And Thursday mornings.
One evening and one morning? That's weird. Do you get a holiday?
Yes, of course! In July.
You'll speak good Dutch by then!
Yes, I hope so!

²⁰ M.A. Moreira, "Aprendizaje significativo: un concepto subyacente", in: M.A. Moreira, M.C. Caballero, M.L. Rodríguez, (eds.), *Actas del Encuentro Internacional sobre el Aprendizaje Significativo*, Burgos 1997, pp. 19-44.

²¹ The learner background knowledge may be based on his/her knowledge or skills in the mother tongue other language and other personal cognitive experience.

²² More in: J.G. Barnitz, "Toward Understanding the Effects of Cross-Cultural Schemata and Discourse Structure on Second Language Reading Comprehension", *Journal of Reading Behavior*, 19 (2), 1986, pp. 95-116.

²³ R. Ellis, op.cit. p. 3.

²⁴ Ibidem, p. 3-4.

²⁵ D. Madrid, E. García Sánchez, op.cit. p. 125.

²⁶ D. Nunan, "Communicative Tasks and the Language Curriculum", *TESOL Quarterly*, 25 (2), 1991, p. 279.

It'll go well, I'm sure! How many words do you know now?
No idea. A hundred? A thousand? Or more? How many words do you know?
Ha-ha, I really don't know"²⁷.

In examining learner's interaction with content some of the aspects should be further studied and implemented, for instance: the distinction between superficial and deep learning²⁸, fostering critical literacy through the use of diversified texts²⁹, autonomous reading and the use of strategies to support the text comprehension and production in DL.³⁰

3.3. Teacher and learner collaboration as interaction in the learning process

The third aspect of student's interaction in class is related to one of the most urgent questions that emerge from the dissemination of distance learning: the extent to which teacher intervention should be implemented³¹. While in the traditional classroom the problem was the teacher-centered approach, i.e. *too much teacher* (who took an excessive control over learning), distance learning confronts the challenge of *too little teacher*. In an extreme case, the course designer creates a course platform, uploads information and disappears. Undoubtedly, in DL, the learner is the one who orientates the learning; hence there is a need for autonomous learners. Nevertheless, autonomy does not equal total freedom or the non-existence of the teacher, but rather the ability to cooperate with the latter and one's peers in the learning process³². DL needs an empowered autonomous activity of the learner enriched by teachers-facilitators guidance and intervention. One of the researches that have dealt with the influence of student-instructor interaction on learning is that by Jiang and Ting, among others³³.

As far as the teacher as facilitator role is concerned, we should emphasize two aspects that should not be disregarded in the LL sphere (and yet they are in DL): teacher feedback and strategy training. Firstly, the teacher should be present through providing information on students' performance and feedback ought to be personalized, thorough and direction-giving. In a research dedicated to computer assisted learning of Spanish, a disadvantage pointed out was the lack of personalized feedback, which should take into account learners affective needs³⁴. Technological solutions offering feedback, such as Quizlet.com used by a MOOC under study, give a feedback which is rather superficial – understood as based on grammar and vocabulary

²⁷ University of Groningen, *Introduction to Dutch Course*, <https://www.futurelearn.com/courses/dutch> [20.03.2015].

²⁸ Compare with: F. Villalba Martínez, "Comprensión del discurso expositivo del profesor en contextos escolares por estudiantes nativos y no nativos", *Dosieres Segundas Lenguas e Inmigración*, 6, 2008, p. 83. This author identifies superficial learning with applying school strategies and memorization in short term.

²⁹ A. Mou, *Interacción lectura-escritura en los procesos de composición de los textos expositivos al final de la educación obligatoria. Tesis doctoral de la Universidad Complutense de Madrid*, 2013, <http://eprints.ucm.es/22392/1/T34659.pdf> [28.02.2015].

³⁰ Another aspect, not treated in this article, would be including the (inter)cultural content (along with the development of intercultural competence as one of the main goals of LL) in the *content* category.

³¹ In this section we perceive the learner-teacher not in the terms of communication as in section 3.1, but in terms of didactic interaction. The teacher plays a double facilitating role: of communication facilitator (guiding the learners' interaction processes in class and participating in them and on the other hand: interaction with texts) and of a pedagogic facilitator.

³² J. Hadaś, "Współpraca dydaktyczna w ramach przygotowań do Olimpiady Języka Hiszpańskiego – wstępne rozważania teoretyczne", Working paper, 2013.

³³ M. Jiang, E. Ting, "A study of students' perceived learning in a web-based online environment", in: *Proceedings of WebNet 99 – World Conference on the WWW and Internet*, P. de Bra, J. Leggett (eds.), Honolulu 1999, pp. 575-580.

³⁴ C.M. Pichastor, "Computers and Their Role for the Teaching / Learning of Languages", *Jornades de Foment de la Investigació*, <http://www.uji.es/bin/publ/edicions/jfi2/computer.pdf> [30.03.2015].

correctness out of the communicative context, with the focus is on formal and not pragmatic (communicative) errors. After a thorough diagnosis of learner's competence, support should be delivered in the form of strategy training, which can give a direction to the learner. Furthermore, while during listening or reading comprehension practice there are many ways to present feedback (symbols, tones, applause, points awarded), in case of oral or written production or interaction the feedback has to be, particularly personally tailored and detailed.

A second kind of pedagogical assistance that the learner should be provided is the strategy training, which aim is for the learner to become more autonomous. Strategy training consists of presenting to the learner's a variety of strategies, encourage him/her to experiment with them in order to choose the ones that work for them and share their experience in classroom discussions. In the traditional classroom this takes place through face-to-face learner-teacher interaction, with a preferable involvement of other students and the teacher as moderator. If definitely there should be a space for presenting, trying out and commenting on strategies³⁵, it's questionable whether this training can be carried out without an interaction with the instructor in an online learning model. Strategy training not only helps to learn specific content and communicate, but it also guides the whole pedagogical process (in a metacognitive sense) as the learner is trained to plan, monitor and evaluate his own progress in collaboration with the teacher.

As a general conclusion about teacher-learner pedagogical collaboration, we should remember the affective role of the presence of teachers, instructors or experts. A need for this "human factor" is characteristic to education in general and not only for LL, as "isolation, one of the major causes of withdrawal from university studies in distance mode"³⁶ and the instructors "bring more than their professional skills and knowledge to practice (...), but also: "personality, identity, integrity, emotions, thoughts, beliefs, values, life experiences, and background"³⁷, which have a significant impact on learning.

Teacher-learner collaboration may be seen as a factor that has an impact on two other previously sketched interactional dimensions, yet it poses serious challenges in DL. Worth considering are the words of D. Little, that "teachers are indispensable (...) the teacher's key role is to create and maintain a learning community; if teachers stop teaching, most learners will stop learning". We support the need for experts presence in virtual LL and the interaction between her/him and learner is important for building the learners autonomous competence to interact with the language (learning content) and with others *via* language. Authors such as Pohjolainen and Ruokamo advocate for improvement of the student-instructor communication,

³⁵ R. Oxford, "Language Learning Strategies: An Update", *ERIC Digest*, 1994, p. 4.

³⁶ A. Reupert, D. Maybery, P. Kent, P. Chittleborough, "The Importance of Being Human: Instructor's Personal Presence in Distance Programs", *International Journal of Teaching and Learning in Higher Education*, 21 (1), 2009, p. 48.

³⁷ P.J. Palmer, "The courage to teach: Exploring the inner landscape of a teacher's life", San Francisco 1998 as quoted by A. Reupert, D. Maybery, P. Kent, P. Chittleborough, "The Importance of Being Human: Instructor's Personal Presence in Distance Programs", *International Journal of Teaching and Learning in Higher Education*, 21 (1), 2009, p. 47.

and the training of educators in the matters of online programs, with a presentation of limitations of DL included³⁸.

Conclusions

An answer to the question “can language learning be effective in a virtual classroom” can be affirmative only provided the above pedagogical criteria will be met. We consider that a foundation basis for a successful interaction in class, in all its three dimensions, will be learner autonomy based on a healthy empowered pedagogical interaction with the teacher, which is a framework for the learner to lead his own communication processes with peers (and the teacher), and to plan, monitor and evaluate his interaction with texts and through texts.

The challenges determined in all these fields are: the inclusion of (practicing and evaluating) of communicative skills with a special focus on speaking, writing and interacting, strategy training and feedback as a necessary support from the teacher, and an implementation of the notional-functional syllabus (in the context of persistence of the grammar approach). What is worth outlining is that some of these challenges are rooted rather in the absence of pedagogical knowledge or in the lack of will to put into practice the communicative approach than in technological obstacles.

In online learning – an opinion based on an observation of chats and forums in several virtual classrooms – learners may find themselves attracted to form and often seduced and misled by the immediate results (a high score in a grammar quiz is treated by them as a sign that they *know* or *have learned* a specific material). The learners, as non-experts in language acquisition studies, are not aware of the fact that systems that do not involve authentic communication (opportunities to use knowledge in order to build up skills and attitudes) do not result in learning to communicate. The focus of the web designers should be placed on the development of communicative competence. Instead they focus on convincing the learner to buy or complete the course and on other quantitative or commercial measures. That is why the virtual classroom needs an expert that will design, monitor and evaluate a learner-oriented system, instead of teacher or content-oriented one. Finally, if the teacher needed to be replaced by the system, he would have to be replaced in all the described aspects of the three interactional dimensions of LL.

On the other hand, we should not forget that the new media “change the message, teacher and student roles and learning outcomes”³⁹ which means that while we adjust the online learning to what we know about offline acquisition, there is still a need to observe how human cognition itself works with the use of technologies. After all, these new processes modify our knowledge of language acquisition as such and shape what we know about offline and online learning.

³⁸ S. Pohjolainen, H. Ruokamo, “Distance Learning in Multimedia Networks Project – Experiences and Results”, in: B. Collis, R. Oliver (eds.), *Proceedings of ED-MEDIA 99 World Conference on Educational Multimedia, Hypermedia & Telecommunications*, 1999, pp. 922-927, as quoted by Mikropoulos, op.cit. p. 9.

³⁹ F. Yu, H.J. Yu, “Incorporating e-mail into the learning process: its impact on student academic achievement and attitudes”, *Computers & Education*, 38, 2002, pp. 120.

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