

Attitudes of Face-to-Face and e-Learning Instructors toward 'Active Learning'

David Pundak,
Kinneret College on the Sea of Galilee and ORT Braude College, Israel,

Orit Herscovitz,
ORT Braude College and the Department of Education in Technology and Science, Technion, Israel,

Miri Shacham,
ORT Braude College, Israel.

Correspondence concerning this article should be addressed to:
David Pundak [dpundak@gmail.com]

Abstract

Instruction in higher education has developed significantly over the past two decades, influenced by two trends: promotion of active learning methods and integration of web technology in e-Learning. Many studies found that active teaching improves students' success, involvement and thinking skills. Nevertheless, internationally, most instructors maintain traditional teaching methods. A research tool – Active Instruction Tendency – (AIT) questionnaire developed on the basis of 'active instructors' experience exposed the transitions they had undergone. Following a review of the literature and examination of 'active instructors' attitudes, six key areas that may characterize the lecturer's tendency to adopt active learning were identified. Using the AIT questionnaire, we examined attitudes concerning active learning of 135 instructors in three Israeli higher education institutions and 56 European distance and e-learning instructors. Their attitudes were compared with the attitudes of 'active instructors' who, for the past five years, have taught in active learning environments. In all six identified instruction areas, significant differences were found between attitudes of 'active instructors' and other instructors. Identification of these differences expands the theoretical knowledge corpus concerning instructors' attitudes toward active learning, presenting a new tool to characterize these attitudes.

Keywords

active learning, active instructors, e-learning, students' involvement, evaluation

Introduction

Over the past decade, researchers and instructors around the world have attempted to promote active learning in academic courses. The process of introducing innovation in teaching based on the adoption of active learning approaches is a long and complex one (Dori et al., 2003; Dori & Herscovitz, 2005; Pundak et al., 2004, Pundak et al., 2008) It is difficult to introduce innovations even when this would clearly be advantageous and beneficial (Rogers, 1995).

The Israeli Ministry of Education has recently begun to promote inquiry learning to encourage teachers to teach in a more meaningful manner. This approach develops inquisitive and creative thought. However, this requirement is mirrored by the demand to prepare students for the matriculation examinations – a process which, in many cases, encourages learning by rote and algorithmic learning rather than the development of higher cognitive skills (Dori et al., 2003).

Higher education institutions also engage with this dilemma. These institutions strive to conform to a packed and demanding curriculum that leaves little time for students to develop a profound understanding of the study subjects. Studies examining innovative teaching that involve students actively in conducting lectures in basic courses (in sciences, engineering, and technology) have found that these methods result in enhanced achievements for the students, a better understanding of the studied material, active involvement and responsibility for the learning process (Barak et al., 2007; Dori & Belcher, 2005; Jose & Pedrosa, 2005; Snellman et al., 2006).

Active Learning in Academic Institutions

Numerous evaluation studies have been undertaken in the United States to examine the advantages of active learning in appropriately-adapted classes. One of the active learning environments developed at the start of the twenty-first century is the SCALE-UP (*Student-Centered Active Learning Environment for Undergraduate Programs*) environment. This approach emphasizes active learning by students in large classes including fifty or more students. Classrooms in this environment were described in detail by Beichner (Beichner et al., 2000; Beichner et al., 2007), who developed this approach. Students in these classes sit at round desks, each of which has room for nine students. Every three students form a group. A significant proportion of the lesson time is devoted to activities by the students, such as problem-solving,

simulation, laboratory investigations, researching websites, writing a position paper, or undertaking a task. The researchers conducted tests in institutions adopting this teaching method in order to gauge the level of conceptual understanding of the studied subjects at the beginning and end of the course. These tests were identical to the accepted tests in the academic world in the USA and, accordingly, could provide a basis for fair comparison between traditional teaching and active teaching. The researchers interviewed students, held discussions with focus groups, examined the students' files, undertook observations, and prepared audio and video recordings of hundreds of hours of active teaching (Beichner et al., 2007). The results point to advantages of the active learning environment in comparison to the traditional learning environment in relation to the following aspects: students' involvement, development of cooperation and collaborative qualities, meaningful learning, and achievements in conceptual and quantitative tests.

Active Learning and Conceptual Understanding

A wide range of evidence supports the concept that active learning students achieve higher conceptual understanding compared to other students who study the same courses according to the traditional learning approach (Dori & Belcher, 2005). The idea that "active learning only supports the under-achiever student and neglects future stars" is in many cases invalid. In a large scale study of 6,500 students studying according to active learning methods, (Hake 1998) found that stronger students exhibited greater improvement of conceptual understanding of Newtonian physics compared to other less skilled-students. Nevertheless, according to Hake's study, both populations improved their conceptual understanding more than students who studied according to traditional learning methods.

Active Learning and Higher Thinking Levels

One of the most significant aims of the active learning approach is to develop high level thinking skills. Students are asked to solve problems according to the scientific method. They collect, analyze, interpret and represent data, and relying on this procedure they design a system, component, or process to meet desired needs (Etkina & Van Heuvelen, 2001).

One of the first educators to address the issue of different levels of thinking skills was Bloom (1956). According to Bloom's taxonomy of learning domains (1956), there are three domains of educational activities: (1) The Cognitive Domain, which involves knowledge and the development of intellectual and mental skills; (2) The Affective Domain, which describes the way we face things emotionally, such as feelings, appreciation, values, enthusiasm, attitudes, and motivations and (3) The Psychomotor Domain, which involves physical movement, coordination, and use of the motor-skills. Bloom described six sub-categories in the cognitive domain, which are measured by degrees and levels of difficulties so that an individual cannot master one of these levels if he/she has not first mastered the preceding sub-category.

According to the active instruction approach, team-work in small groups plays a crucial part in the lesson. Practicing problem-solving exercises leads students to pay attention to their thinking strategies. The new knowledge that they develop is organized, analyzed, applied, and evaluated through thinking procedures (Zohar & Dori, 2003). 'High level thinking' is an action hard to define, but it can be characterized by particular key qualities, which are recognized when they occur (Resnick, 1999). This type of thinking is not algorithmic, and the thinking and action patterns students have to choose cannot be clearly pre-determined. In many cases the students' products are multiple solutions and each of them has advantages and disadvantages. Uncertainty is often an immanent part of high level thinking, and it necessitates a high level of independence, judgment and decision making (Dori & Herscovitz, 1999; Zoller, 1987).

In a research on Computer Supported Collaborative Learning (CSCL) environments, Ada (2009) found a positive correlation between the quality of the group's engagement in a collaborative process and the quality of cognitive skills fostered. She asserted that "*high levels of social interaction and collaboration contributed to the establishment of a community of learning, nurturing a space for fostering higher order thinking through co-creation of knowledge processes*" (p.145).

Students' Satisfaction regarding Active Learning

In active learning in the SCALE-UP environment in the US, students are not required to attend class. Despite this, average attendance in the University of North Carolina is as high as ninety percent. Most of the students choose to study in this format in their second year of studies on the basis of recommendations from fellow students. The percentage of dropouts from active courses using this approach was measured at Florida International University and was found to be one-fourth of the dropout rate for similar courses using traditional teaching approaches. The level of satisfaction of students and instructors at FIU with the course using the active teaching method was particularly high in comparison to other courses. Following their exposure to this teaching method, ten to twenty percent of students chose to focus on science studies (Kramer, Brewe & O'Brien, 2008). In conclusion, most researchers who examined active learning identified an improvement in the following indices: conceptual understanding, test achievements, reduced dropout rates, student satisfaction, team work, and problem solving.

Instructors' Perceptions of Active Learning

Numerous studies have been undertaken in recent years regarding instructors' perceptions of their function in academic institutions. Some researchers have made a distinction between perceptions focused on the instructor's knowledge transmission and information transmission, perceptions focused on the instructor-student relations, and perceptions focused on the student's activities and the development of understanding and conceptualization (Gerlese & Akerlind, 2004; Kember, 1997; Samuelowicz & Bain, 2001).

Freire (1970) related critically to the "banking" approach to education - a metaphor used by Freire to suggest that students were considered as empty bank accounts that should remain open to deposits made by the teacher. Education becomes an act of depositing, in which the teacher is the depositor and the students are depositories patiently receiving, memorizing, and repeating the deposited data transferred by the teacher; there is no chance for active communication. Freire rejects this "banking" approach, claiming that it results in the dehumanization of both the students and the teachers. In addition, he argues that the banking approach stimulates oppressive attitudes and practices in society. Additionally, Freire claims that authentic and valuable knowledge can only emerge through invention and re-invention, through restless and impatient, hopeful inquiry, when human beings communicate with each other and interact with the world. The approach of active learning is opposed to the "banking" model of passive student absorption of information from an authority figure and focuses instead on the student-teacher dialogue and the development of active knowledge construction by the students.

Most academic instructors tend to adhere to traditional teaching approaches, according to which the principal function of the instructor is to convey knowledge. In traditional teaching the students generally remain passive and are not invited to express their opinion, cope with problems, or consider possible solutions (Harmin, 2006; Redish, 2003).

In a study that interviewed 332 instructors and teachers (Niemi, 2002), the respondents noted six variables that they felt prevented them from engaging in teaching that promotes active learning:

1. Lack of time due to the need to complete all the required material in a packed curriculum.
2. Teaching in large groups does not permit active teaching.
3. A shortage of study materials suitable for the active teaching approach.
4. Opposition among senior peers to changes after they have developed teaching methods suited to their capabilities and experience.
5. A lack of meta-cognitive skills and motivation on the part of the students. The instructors feel that students prefer traditional learning.
6. Among high school teachers, parental opposition to change was also mentioned.

In addition to these variables, instructors argue that difficulties occur in the assimilation of active learning when students lack background knowledge in the studied subject. Active learning also demands more work from both instructors and students than traditional teaching (Scheyvens, Amy & Griffin, 2008). It seems that the reluctance to adopt teaching innovations is also related to the professional development of the instructors. Burke (1987) indicates that professional development occurs in three cycles: Induction, Renewal and Redirection. The first cycle – induction – is characterized by worries and attempts to survive (Huberman, 1993). These feelings are not limited to the first time that the instructors stand in front of the students, but often recur during their instructional career, for example, when an instructor answers the need or demand to change instructing methods and attempts to replace traditional instruction with active instruction.

Research Rationale - e-Learning and Active Learning

Development of Web technology over the last two decades has led to a productive blooming of e-Learning methodology (Mabrito, 2006). E-Learning materials and environments have several identifying characteristics: 1. **availability** - the learning materials are available on the net and students can easily download them; 2. **multiple representations** - the learning materials combine text, graphics, animation, sound and video; 3. **multiple communication tools** - several specially-developed social tools support e-Learning such as: discussion groups, e-mail, video conference, blogs and social networks. E-Learning instructors at the beginning of twenty-first century rely on this environment to implement various pedagogies.

E-Learning pedagogies spread over a continuum from the most traditional form employing mainly textual learning material and summative student evaluation, which is only delivered at the end of the course, to active learning where the instructor guides and supports the students at every stage of the learning through a number of formative evaluations (Nevo, 1995). It therefore seems obvious that the dramatic development of technology can easily support active learning in e-Learning courses. Moreover, social web-technology enables the e-Learning instructor to overcome disadvantages involved in the lack of face-to-face meetings with the students. Nevertheless, any additional involvement beyond the delivery of learning material demand extra efforts and time. The conflict between the aspiration to improve the e-Learning courses and the desire to avoid increased time and efforts required to organize and administer the course, leads to the development of innovative instruction styles.

Development, instruction and evaluation of e-Learning courses demands planning and continuous efforts to deliver the learning material, to evaluate students' responses, manage discussions groups and adjust the learning directions. Observation of instructors' preparation models for teaching in an e-Learning environment reveals the complexity of e-Learning. MEDA ETE^[1] (The Euro-Mediterranean Partnership's Education and Training for Employment) project for example, divided the e-learning preparation into ten modules: 1. ICT and e-Learning skills, 2. e-Learning overview, 3. Design and development, 4. Didactics and structures of e-Learning, 5. Content development, 6. Students' activities, 7. e-Learning platform 8. Tutoring 9. Assessment and Evaluation 10. Management aspects. In the MEDA ETE project, like many others, the importance of students' activities was emphasized and instructors were trained to identify the students' responses and to react toward each student or students' group. Considering the pedagogic training of most e-Learning instructors it is reasonable to assume they will tend to employ active learning.

Research Background

With the goal of promoting meaningful active learning by students and integrating innovative teaching approaches, the management of an academic engineering college in Northern Israel decided to integrate active learning in some courses at the college. The courses' environments integrated various technologies such as a learning web-site that accompanied the course, web assignments and checkers, a computer network in the active learning class (Scale-Up environment), and discussion groups (Pundak & Rozner, 2007). Over the past five years, seven instructors at the college have been involved in a program focusing on the development of innovative teaching technologies and the transition from traditional teaching to teaching for active learning. The instructors participated in workshops offering an introduction to teaching methods for active learning and subsequently prepared learning kits for introductory courses at the college in Mathematics, Physics, and Chemistry (Pundak & Rozner, 2006). The active learning environments included group activities by students during the lecture, conceptual tests, peer teaching (Mazur, 1997), active demonstration (Cooper & Robinson, 2000), simulations (Dori et al., 2003), group problem-solving (Redish, 2003), integration of a web-based task examiner (Pundak et al., 2004), a dynamic course website (Scheyvens et al., 2008), and 'just in time' teaching (Beichner et al., 2000).

In interviews with these instructors (hereinafter – the 'active instructors') they reported significant changes in their attitudes to teaching and in their perception of the students' learning process in the courses they taught according to this approach. These instructors play the role of reference group in our research. Over the years, the remaining instructors at the college were offered workshops presenting various components of active learning. Participation in these workshops was partial, and their influence on the instructors has not yet been examined. Following changes in the perception of teaching and learning among the 'active instructors', it was decided to examine attitudes regarding active learning among all the instructors in the college, in order to identify those instructors whose perceptions were closer to those of the 'active instructors'. In addition to the college instructors the study focused on another population, e-learning instructors. On the basis of e-Learning theory (Mabrito, 2006), we assumed that e-Learning instructors would express a tendency towards active learning in order to compensate for the limitations of online learning (Nevo, 1995). In both cases the 'active instructors' were used as the baseline group, according to their position the academic and e-Learning instructors' groups were measured.

Research Goals

The research goals included identification of the characteristic attitudes of 'active instructors' toward active learning and discerning a distinction between these attitudes and those of the remaining instructors in the college, hereinafter – F2F (face-to-face) instructors, and attitudes of e-Instructors.

The following research questions were derived from the research goals:

- A. What are the characteristics of the 'active instructors' attitudes toward active learning?
- B. Is there any gap, and if so how large, between the attitudes of the 'active instructors' and the attitudes of the other instructors (which include the F2F and e-Instructors) regarding active learning?
- C. Is there any gap, and if so how large, between the attitudes of the F2F instructors and the attitudes of the e-learning instructors regarding active learning?

Research Population

The study examined the attitudes of 216 instructors, who voluntarily agreed to answers on the research tools via web. The Israeli instructors taught in science, technology and engineering faculties in higher education academic institutes. The instructors were divided into three groups:

- (1) F2F instructors' group included 153 F2F instructors at one university and two colleges in Israel.
- (2) The e-Learning instructors' group included 56 European e-learning instructors, who attended the EDEN^[2] 2009 Annual conference. Our assumption was that the participants in

the conference were all involved in e-learning to some degree;

(3) The 'active instructors' group included 7 instructors who had been involved in the development of active learning methods and served as a reference group in this study.

The 'active instructors' were faculty members from various disciplines at one of the colleges included in the research who had spent five years developing active learning materials and implementing these materials in a special designed classroom. The special active learning classroom - Scale Up - was developed at the college on the basis of studies undertaken at the University of Northern Carolina and at MIT (Beichner et al., 2007).

Development of the Research Tool

The research tool: Active Instruction Tendency (AIT) questionnaire, see Appendix 1, is an attitudes questionnaire developed specially for the purpose of revealing instructors' attitudes towards active learning (Pundak, Herscovitz, Shacham & Weizer-Biton, 2009). The questionnaire was developed on the basis of the experience of the 'active instructors' and interviews with those instructors exposing the process of change they had undergone. Over the five-year period in which active learning was developed and integrated in basic courses at the college, the 'active instructors' were interviewed twice in each semester. An analysis of these interviews provided the basis for characterizing the attitudes of 'active instructors' and subsequently for the development of the research questionnaire: the Active Instruction Tendency - AIT questionnaire (Pundak et al., 2009).

On the basis of a review of the literature (Johnson et al., 1998) and an examination of the attitudes of the 'active instructors', a **content analysis** was undertaken, sorting attitudes into six key domains in which it is possible to distinguish tendencies that characterize an instructor who is inclined to use active teaching. These domains are:

1. **Large Class** - Activation of a large class
2. **Involvement** - Student involvement in the course
3. **Independence** - Independent learning by students
4. **Development of knowledge** - by students
5. **Quantity versus understanding** - A tendency to prefer understanding of the material to full completion of the syllabus
6. **Instructor role**- Perception of the role of the instructor.

Table 1 presents the six domains identified as containing the characteristics of the attitudes of the 'active instructors', as well as the ways in which these attitudes are manifested in active teaching in comparison to the attitudes identified with traditional teaching.

Table 1. Description of the Six Domains addressed by the AIT Questionnaire and their Manifestation in Traditional Teaching/Learning and Active Teaching

No.	Domain of teaching / learning	Manifestation in traditional teaching	Manifestation in active teaching
1	Large classes	There is no requirement to activate the students in a large class and they cannot be guided	Students in a large class should be activated, particularly by means of group work
2	Involvement	Participation in classes is optional; students succeed in the course if they pass the final test	Student participation in classes is vital in order to ensure that they understand the subject matter and are successful in the course
3	Independence	Students should not be expected to have knowledge of study topics not presented in class by the instructor	Students can learn topics from the syllabus by themselves, if they receive proper guidelines
4	Development of knowledge	The students' level of scientific knowledge does not enable them to develop new scientific knowledge	Students can present new scientific arguments and ideas by themselves
5	Quantity versus understanding	It is important to teach the whole syllabus; students should not be expected to gain a profound understanding	It is important for students to understand the basic concepts of the course as a foundation for more complex scientific knowledge

6	Function of instructor	The instructors should focus on their function as transmitters of knowledge	The instructor should identify the students' learning difficulties and develop appropriate teaching methods
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The domains of teaching/learning identified on the basis of the experience of the 'active instructors' are consistent with principles of Constructivist Theory and the approach of participatory learning in small groups (Johnson et al., 1998). According to these approaches, the learning process, the development of a conceptual world, and the connections between the two are undertaken actively by the learner through the process of coping with different possibilities and examining these against the background of reality in team work (Vygotsky, 1978, pp. 79-91). The validation and reliability of the AIT questionnaire were described in our previous paper (Pundak et al. 2009) and the questionnaire is attached in Appendix 1.

Method

All the instructors answered the AIT questionnaire by Web-survey^[3] or by WebAssign^[4]. Two groups: the F2F instructors and e-Learning instructors were sampled, with their consent, by answering an online AIT questionnaire. The percentages of responses were 46% for F2F instructors and 19% for e-Learning instructors. The third group of respondents in this study was composed of the seven 'active instructors' and constituted the baseline group.

Research Findings and Discussion

Differences between F2F instructors, e-Learning Instructors and 'Active Instructors'

The study compared the average score of the attitudes of 153 F2F instructors and 56 e-Learning instructors in each of the six domains in comparison with the average attitudes of the 'active instructors' group (N=7). The comparison of averages was undertaken using Kruskal-Wallis parameter free analysis. Table 2 presents the results of the comparison. The ranking of the attitudes was determined on the basis of the research questionnaire; a high ranking reflects a tendency on the part of the instructors to engage in promoting active learning, while a low ranking reflects a tendency to traditional teaching.

Table 2. Comparison between the Ranking of Attitudes of F2F instructors and e-learning Instructors and the Ranking of Attitudes of 'Active Instructors' in Six Domains of Teaching/Learning according to a Kruskal-Wallis Test

Domain / Variable	Function of instructor	Quantity/ Understanding	Development of knowledge	Independence	Involvement	Large class
Ranking of F2F instructors	63.3	60.6	62.1	64.5	61.8	67.7
Ranking of E-Instructors	70.3	47.7	72.4	68.6	75.5	76.1
Ranking of 'active instructors'	115.8	116.6	116.1	114.8	107.3	142.1
Chi squared	12.2	19.6	13.7	11.0	10.9	20.6
Significance	<0.001	0.004	0.004	0.001	<0.001	0.002

The results in Table 2 reflect a significant difference in all six domains addressed by the research questionnaire between the average attitudes of both the F2F instructors and the e-Learning Instructors in comparison to the base-line group of the 'active instructors'. Three most significant differences were evident between these two groups.

The findings of the study show that the largest gap between the ranking of the 'active instructors' and the other instructors was in the domain of pedagogy in large classes. The 'active instructors' believe that it is possible for students in a large class to be active or take part in active processes and to be divided into small learning groups. A plenum session can be used to guide the students and to develop productive discussion. Most of the F2F and e-Learning instructors tend to believe that discussions in a large class create noise and do not lead to any progress in learning the subject matter. The F2F and e-Learning instructors' attitude is that it is impossible to achieve personal contact with students in groups or as individuals in a large class. The structure of the lectures by 'traditional instructors' focuses mainly on course content and less on the manner in which the students interpret this content or integrate it within their prior knowledge. A

'traditional instructor' does not usually address the social process involved in group activation and seems to be unaware of this process. Conversely, 'active instructors' who have experienced group work note the importance of involving students in the course in order to enable them to achieve its objectives.

A further prominent difference between 'active instructors' and 'traditional instructors' relates to the importance of achieving understanding versus quantity in the curriculum. 'Active instructors' prefer to move forward with the study material only after ensuring that most of the students in the course have reached an adequate level of understanding of the study material, whereas 'traditional instructors' prioritize the demand to complete the course studies, even if this means that students do not properly understand the study material.

The third domain that exhibited a large gap between the groups was the function of the instructor. While the tendency of most F2F and e-Learning instructors was to emphasize the role of the instructor as the 'knowledge deliverer', the 'active instructors' related to this point only as one role among many others that the instructor should fulfill. From the interviews with the 'active instructors' we have found that they believe that in addition to transmitting knowledge, the instructor should have other roles such as recognizing students' difficulties, guiding students in various assignments during the lessons, directing the groups' work, encouraging students to present their solutions in front of class, raising their level of thinking, and developing methods for the students to provide feedback to one another.

These significant gaps and lesser gaps in the other three domains, point up large differences between F2F instructors who did not make efforts to create an appropriate atmosphere in class that could help prepare students to face the needs of their future employers (Etkina & Van Heuvelen, 2001) and those who are trying to devise and employ new more appropriate teaching methods.

Comparison Between e-Learning instructors' and F2F instructors' approaches regarding active learning

The significant gap between the 'active instructors' and the other two populations in this study raises another question, regarding active learning: is there any difference in the extent of tendency of e-learning instructors and F2F instructors to utilize active learning? Aiming to answer this question, T-tests were executed to compare these two populations. The results appear in Table 3.

Table 3. Comparison between the Mean of F2F instructors' Attitudes and the Mean of e-Learning instructors' Attitudes in Six Domains of Teaching/Learning according to the T-Test

Domain / Variable	Function of instructor	Quantity/ Understanding	Development of knowledge	Independence	Involvement	Large class
Mean of F2F instructors	3.75	3.55	3.83	3.56	3.54	2.70
Mean of E-Instructors	3.87	3.42	4.01	3.63	3.80	2.80
Significance	0.39	0.08	0.11	0.42	<0.01	0.52

No significant differences were found between the means of e-Learning instructors and F2F instructors in four domains of teaching/learning. In the involvement domain we found a significant difference ($P < 0.01$) which points to a stronger tendency of e-learning instructors to encourage students' involvement in the course, in comparison to the F2F instructors. On the other hand the F2F instructors reveal a significant preference ($p = 0.08$) toward improving the students' understanding of course contents in the case where the need to cover the full syllabus clashes with the need to clarify students' difficulties.

Tendencies of F2F instructors to Adopt Active Learning Methods

Despite the evident differences between the attitudes of 'active instructors' and the other instructors toward active learning, we assumed that some components of active learning infiltrate into the pedagogy of the latter. In order to evaluate the tendency of these instructors at academic institutions to adopt active learning we built a linear model using an Active Learning Coefficient (ALC).

The ALC is a weighted coefficient combine from the instructors' attitudes in the six domains of the AIT. A linear regression was made on ALC, by ANOVA. The results of the linear regression are presented in Table 4.

Table 4. Models of active learning tendency of instructors in academic institutions. The three models were developed by linear regression

	Model	Sum of Squares	Degree of Freedom (df)	Mean Square	F	Significance
1	Regression	9.492	1	9.492	119.887	.000(a)
	Residual	4.038	152	.079		
	Total	13.530	153			
2	Regression	12.047	2	6.024	203.186	.000(b)
	Residual	1.482	151	.030		
	Total	13.530	153			
3	Regression	12.707	3	4.236	252.222	.000(c)
	Residual	.823	150	.017		
	Total	13.530	153			

a. Model 1 - only large class (first domain in AIT).

b. Model 2 - large class + quantity/understanding (fifth domain in AIT).

c. Model 3 - large class + quantity/understanding + independence (third domain in AIT)

From the results presented in Table 4 it seems that Model 1 explains 70.2% of the variance of ALC in the F2F instructors' attitudes toward the use of active learning instruction in a large class.

Model 2, is a combination of two domains 1 and 5 (quantity/understanding) and it explains 89.0% of the variance of ALC.

Model 3 includes three domains 1+5+3 (independence), it explains 93.9% from the variance of ALC.

According to these results pedagogy in large classes is the domain with the largest variance between the F2F instructors. It is assumed that some F2F instructors still teach according to unchanged 'good old' methods they learnt as students in institutions all over the world – 'talk and chalk'. Others divided their lectures into segments and in between these segments conducted discussions. Another group of F2F instructors used presentations with animations and active demonstrations, and some instructors used an array of different methods for active learning (Cooper & Robinson, 2000).

Summary and Conclusions

One of the major goals of education today is to promote students' active learning as a way to improve students' conceptual understanding and thinking skills. Although there is clear evidence for the benefits of active learning, most lecturers in higher education still adhere to traditional teaching methods. The first step in order to integrate innovation into teachers' instruction is to reveal their attitudes towards such innovations. In this research we identified and characterized six domains in which it was possible to distinguish different attitudes towards active learning and constructed an attitude questionnaire based on these domains. This questionnaire was developed on the basis of the experience of 'active instructors' and interviews with them, and validated by teaching instructors from several academic institutions (Pundak et.al., 2009).

Our diagnostic tool, the Active Instruction Tendency - AIT questionnaire allows schools and educational institutions to indicate the extent to which their faculty members' attitudes lean toward active learning. The AIT questionnaire supplies crucial information to the colleges' and universities' directors when planning supportive steps toward advancing active learning in their institutions. In some countries a gap has been found between higher education institutions and high schools in the implementation of active learning. While in high schools the adoption rate of active learning approaches is quite high (Dori & Herscovitz, 1999, 2005; Zohar & Dori, 2003), in academic institutions only a small fraction of instructors award attention to this approach, and an even smaller fraction consider its adoption for their teaching (Harmin, 2006; Redish, 2003). The present authors believe that active learning could contribute to students' involvement and achievements in academic courses and that their tool (the AIT questionnaire) could help instructors and the educational institutions to plan the adoption of this approach

This AIT questionnaire can serve as a practical tool to identify instructors whose attitudes are close to those of 'active instructors' and may be open to the use of innovative methods. It can also be used to locate these instructors and suggest that they join the group of instructors using the active teaching approach.

The largest gap found between 'active instructors' attitudes and the other instructors' attitudes was in the domain of activation of a large class. This indicates a large gap between what traditional instructors believe can be done in large classes and what 'active instructors' believe can be done to promote active learning. These issues should be addressed by teacher training developers, by providing greater focus for methods and instructions that guide the activation of students in large classes and by conducting training courses and seminars to promote active learning

This study also reveals small differences between e-Learning and F2F instructors in their tendency toward active learning. We assumed that the e-Learning instructors have a stronger tendency toward active learning as a result of the following reasons:

- a. Preparation for e-Learning - in many institutions, the procedure preparing a teacher/ lecturer to become an e-Learning instructor, includes learning about pedagogy of students' activities and how the instructor should manage these activities.
- b. Activating E-Learners - the fact that e-Learning instructors do not meet their students face-to-face but manage them virtually, on-line, forces the e-learning instructors to communicate with the e-Learners by activating them.

However, the results of our study did not reveal any clear advantage for e-Instructors' tendency to adopt active learning. These results could be explained by the instructors' tendency to maintain their traditional F2F teaching style even when they begin to teach virtual classes. In some cases economic constraints directed the institutions to develop e-Learning courses, alongside the F2F courses. However it seems that in the case of the present study the population of the e-Learning instructors did not modify their instruction style toward active learning. The small sample of e-Learning instructors questioned in this study simply indicated a tendency to maintain the traditional teaching style. Further study is necessary to clarify this tendency.

[1] <http://www.meda-ete.net>

[2] EDEN – European Distance and E-Learning Network - <http://www.eden-online.org>

[3] <http://freeonlinesurveys.com>

[4] <https://www.webassign.net>

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Appendix 1: The Study Questionnaire - Active Instruction Tendency - (AIT)

This questionnaire consists of 35 statements relating to how you understand teaching. You may either agree or disagree with some of them. Please rank each of statements by circling one of the numbers (from 1 to 5). The meaning of the numbers is shown in the table below.

5 Definitely agree	4 Agree	3 Neutral	2 Disagree	1 Definitely disagree
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Please relate to each of the statements by circling the number that best reflects your attitude. Please work quickly. There is no need to too delve deeply into each of the statements. The statements were designed to be simple and easy to understand. If you don't understand one of the statements, leave it unmarked. If you do understand the statement but don't have a clear attitude you are welcome to choose #3.

Thank you – The Research Team.

No.	Item	Attitude
1	The main result of noise in a large class (more the 40 students) is that it disturbs the process of learning.	1 2 3 4 5
2	The instructor, besides his/her role as knowledge provider, is to guide students in the learning process.	1 2 3 4 5
3	The students can, during peer discussions, discover new scientific knowledge.	1 2 3 4 5
4	The instructor, in addition to his/her duty as a teacher, should become familiar with students' learning difficulties.	1 2 3 4 5
5	Students can present in the class new ideas and arguments through their own efforts.	1 2 3 4 5
6	Learning in large classes reduces learning efficiency.	1 2 3 4 5
7	It is legitimate to test students on subjects they learned on their own and that were not studied in class.	1 2 3 4 5
8	Students don't do weekly assignments which were not studied in class.	1 2 3 4 5
9	The students' limited scientific knowledge does not allow them to build new knowledge.	1 2 3 4 5

10	It is important to define in the syllabus components which are very important and will not be waived, and components which can be waived.	1 2 3 4 5
11	Collaborative work in groups allows efficient learning in a large class (more than 40 students).	1 2 3 4 5
12	There is no chance to generate discussion in a large class that includes most of course students (more than 40 students).	1 2 3 4 5
13	It is important to require that students should submit all of their assignments in basic courses.	1 2 3 4 5
14	The instructor should focus on his/her role as knowledge transmitter.	1 2 3 4 5
15	Background noise in a large class (more than 40 students) may be an indication of groups of students learning efficiently.	1 2 3 4 5
16	Students aren't ready to present knowledge they have learned in the course.	1 2 3 4 5
17	Instructors' feedback related to preparation of assignments or summaries encourage students to learn.	1 2 3 4 5
18	The instructor should present to the students all of the course materials during the lesson and not rely on students learning on their own.	1 2 3 4 5
19	It is preferable to focus mainly on problem solving and less on formal understanding of basic concepts.	1 2 3 4 5
20	Discussions between students related to course materials are vital for a deeper understanding of the course material.	1 2 3 4 5
21	The instructor should make every effort to identify and address students' learning difficulties.	1 2 3 4 5
22	In large classes, during work group, the instructor has the opportunity to provide personal guidance.	1 2 3 4 5
23	The final exam is not a good enough tool for providing a student feedback about his knowledge and skills in the course.	1 2 3 4 5
24	Students will not learn beyond what they must even in a course that generates interest and curiosity.	1 2 3 4 5
25	During the examination, don't ask students questions on subjects that were not studied in class.	1 2 3 4 5
26	The instructor may present part of the study program in class and another part leave for guided learning.	1 2 3 4 5
27	It is possible to teach in a meaningful way only when a student understands the basic concepts.	1 2 3 4 5
28	The instructor doesn't need to know the students' difficulties in his/her course.	1 2 3 4 5
29	There is now way for personal guidance in a large class (more than 40 students).	1 2 3 4 5
30	Students may be happy to have the opportunity to appear before the class and present their ideas and solutions.	1 2 3 4 5
31	Students can be evaluated in basic courses only by means of a final exam.	1 2 3 4 5
32	It is possible to create a course atmosphere where students read their task assignments before the lesson.	1 2 3 4 5
33	Students learn each time a limited part of course syllabus, therefore it cannot be expected from them to generalize and create new scientific knowledge.	1 2 3 4 5
34	It is important to cover the entire syllabus during the course.	1 2 3 4 5
35	It is preferable to emphasize the technical aspects in problem solving over the theoretical aspects.	1 2 3 4 5