Online Learning for Students from Diverse Backgrounds: Learning Disability Students, Excellent Students and Average Students

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Abstract

The perceived contribution of science education online course to pre-service students (N=121) from diverse backgrounds - students with learning disabilities (25 LD students), 28 excellent students and 68 average students is presented in this five years research. During the online course students were asked to choose a scientific subject; to map it and to plan teaching activities; to carry out the proposed activities with students in a classroom experience; and to reflect the process. The assumption was that adapting the online course by using information and communication technology following formative assessment will improve students' self-learning ability as well as broaden their science knowledge, their lab performance and teaching skills.

Data were collected using quantitative and qualitative tools including: pre and post questionnaires and nine (three students from each group) depth interviews upon completion of the course. Findings, based on students` perceived evaluation, pinpointed on the advantages of the online course for students of the three groups. LD students' achievements were not inferior to those of their peers, excellent students and average students. Yet, it carefully reports on a slight but explicitly marginal perceived evaluation of the LD students in comparison to excellent students and average students regarding: forum participation, authentic task and water lab performance. The article discusses the affordance of the online course via additional features that can be grouped into two categories: knowledge construction and flexibility in time, interaction and knowledge. Further research is suggested to extend the current study by examine the effect of other courses and different contents and by considering various evaluation methods of online courses, such as: observation, the think aloud, text and tasks analysis, and reflection.

Keywords: Online learning; students with learning disability; excellent students; science education.

Introduction

The advantages of an online Science Education course to pre-service students (students in their second grade toward B.Ed degree) from diverse backgrounds are presented in this study. In light of the importance of online learning as a teaching tool, an ongoing five-year study was designed to face the challenge of adapting a course for three groups of students: students with learning disabilities, excellent students, and average students. The "Science Education" on-line course is part of the teacher-training program for K-2 pre-service teachers which focuses on constructing a science teaching unit and is based mainly on learning scientific concepts, including fostering lab skills, and practicum. Adapting a science education online course by using information and communication technology following formative assessment was a challenge for students with different needs and capabilities as well as for their lecturers. The study will describe students` evaluation of the perceived advantages of the online course and the way it dealt with the challenge.

Literature Review

Accessibility of online learning

During the last twenty years, studies focusing on the integration of Information and Communication Technology (ICT) in teaching (Chazan, 2001), shows teacher and student lack of knowledge of technology (Wegner, Holloway, & Crader, 1998), and hardware limitations (Goldstein, Shonfeld, Waldman, et al., 2011; Kreka, 1996) .During this time new technology-based teaching methods and processes have been developed and incorporated in active learning processes (Venezky & Davis, 2002). Additionally, a great number of studies on the appropriateness of the learning styles (Fuller, Norby, Pearce, & Strand, 2000), and the characteristics of students who benefit from online courses (Lockee, 2001) have also been made. Tthere are no conclusive answers to the nature and extent of the impact of online learning for students with diverse backgrounds. Researchers agree that students taking online course are required to possess self-learning abilities, maturity and high self-discipline, high motivation, the capability of expression and communication in writing, time organization skills (Leasure, Davis, & Thievon, 2000), as well as the ability to manage an online learning environment (Buchanan, 1999; Diaz & Cartnal, 1999; Trentin, 2002).

Furthermore, Cavanaugh, Barbour & Clark (2009) pointed to greater improvement in critical thinking, researching, use of computers, independent learning, problem solving, creative thinking, decision-making, and time management skills of online students compared to their counterparts in traditional classroom settings. Not surprisingly, the online learning environment poses some challenges to student learning as well as numerous benefits. The challenges most often reported in the research literature generally fall into two broad categories: challenges due to a mismatch between students' specific learning style preferences and the online learning environment and challenges in communication. With respect to these challenges, researchers suggested that in an online environment extroverted students may miss the face-to-face interaction with peers and students who do not have strong verbal/reading skills may experience a disadvantage in a text-heavy online environment. In addition, using problem solving and computer-mediated communication, such as the MindTool software (essentially any computer program the learner uses to engage and facilitate critical thinking and higher order learning, such as: databases; semantic networks -concept maps; spreadsheets; expert systems; system modelling tools; micro worlds; search engines; visualization tools; multimedia publishing tools; live conversation environments; and computer conferences), may encourage critical thinking and can help in implementing cooperative learning based on technology (Jonassen, 2005).

Diverse background students

Policies to promote widening participation, benchmarks, and incentives to recruit students from more diverse backgrounds and those with disabilities have led to a doubling of the declared number of students with disabilities entering higher education over the last 10 years (NLCLE, 2007). Counterpart to the students with learning disabilities is the excellent students who are an integral part of higher education (see Methodology).

Students with learning disabilities

Students with learning disabilities might be affected by a group of disorders that affect the ability to acquire and use listening, speaking, reading, writing, reasoning, or math skills (National Center for Education Statistics, 2000). Profiling individuals with LD is not easy because the most cited characteristic of this group is that each individual is unique. However, despite the diversity, most individuals with LD share some common patterns of behavior. They have decreased motivation to learn, are inactive in learning, need tasks to be broken into smaller units, have problems with generalizing, and are poor in problem-solving and thinking skills (Smith, 1998). The Internet has the potential to dramatically change the way students continue with their formal education (Hill & Buerger, 1996), particularly students with learning disabilities who need the convenience of Web Based Instruction (WBI). WBI allows students to be self-directed and self-paced, with the possibility of repeated reiteration, giving instructors the tools necessary to organize and deliver content in well-defined teaching systems and expand the learning process by providing activities such as discussion forums (Kesselman & Tobin, 1999).

In addition, electronic texts offer many advantages over print-based materials for students who learn in a web-based environment (O'Neil, & Fisher, 2008). However, for students with learning disabilities, these advantages were not realized (Kwesi, 2002; Skylar, Higgins, & Boone, 2007). On the other hand, Simoncelli & Hinson (2008) employed Universal Design for Learning (UDL) methods that can be used for all students, including those with learning disabilities, and how proper use of UDL can benefit these learners in the ever-changing online learning environment. The findings reflected no apparent differences between two students with learning disabilities and three without disabilities in regard to the use of instructional media.

Researchers (Brunvand & Abadeh, 2010; Skylar et al., 2007) reviewed a variety of tools and techniques that teachers can use to help make online learning more manageable for students with disabilities. Tools such as ShareTabs and TrackStar (Web sites for an interactive, online lesson), are designed to make it easier for teachers to share multiple Web sites, but for some students the task of having to work through multiple sites may still be overwhelming, even with the support and guidance provided by these resources. To accommodate these students, teachers can use a variety of tools designed to annotate and highlight individual Web sites rather than looking to share a collection of different sites.

Excellent students

The excellent students are part of a selective, demanding, and rewarding program for those seeking an intellectual challenge and who are prepared to invest the extra effort required to meet that challenge (NLCLE, 2007). Thomson (2010) states that online programming can be an effective means of meeting the needs of many gifted students, based on in-depth qualitative and quantitative investigation of the perceptions and experiences of gifted students and their teachers of courses offered through an online program designed specifically for them. Students were able to work at a pace consistent with their rate of learning, had more time to reflect, felt more in control of the learning process, and engaged in more self-directed and independent learning. The online course described here is a general course which enables learning in heterogeneous groups made up of excellent students, students with learning disabilities, and average students (Ronen & Shonfeld, 2008).

Online science education course

Science plays a key role in preparing K-2 pre-service teachers. Nonetheless, most of them are reluctant to get involved in science (Ashenhaimer, Kashtan, Gur, Zymerman, & Eldad, 2001). The question of quality and comparability of online learning naturally arises, mainly in relation to workshop courses based on labs, which are typically (Face to Face) F2F oriented. Trying to highlight the advantages of online labs for diverse background pre-service teachers, Ronen & Shonfeld (2008) designed an online course which is based on hands-on labs. The online course challenges the attempts to promote science instruction and foster student-teachers' lab skills. In addition, the online science education course provides a model to follow in the field.

The purpose of this study is to examine the extent to which an online science education course works for pre-service students of diverse backgrounds, including students with learning disabilities, excellent students, and average students.

Methodology

The purpose of this study was to examine the extent to which the online course "Science Education for K-2" is the appropriate learning environment for different student teachers ─ "LD," "Average," and "Excellent" students ─ based on learners' perceived evaluation in these aspects: (1) The contribution of the online course to learning, (2) the degree of coordination between online tools for learning, and (3) the degree of interaction between participants in the course. The findings reflected the adjustment of the course to the learners, as it was perceived by them, despite the possible bias which limits self-reporting and the trend to answer according to what is considered desirable (Paulhus, 2002). Nevertheless, researchers argue that exploring personality features (such as the emotional intelligence trait) in a study can be measured by self-reported questionnaires (Petrides & Furnham, 2001). Similarly, the present study examined the potential behavior of students, via self reported questionnaires, i.e., capabilities (such as self-learning) and behaviors (such as time organization). Data was collected through attitude questionnaires distributed to all students attending the course and through interviews with three representatives of each group. The quantitative findings allowed comparison between the three groups of students, and the interviews revealed students' attitudes and abilities, as is customary in qualitative research (Shelsky & Alpert, 2007).

The online "Science Education for K-2"

The online "Science Education for K-2" is intended to expose students to a variety of scientific topics taught in early childhood classes and focuses on constructing a science teaching unit. It was based on project-based learning (PBL), most of which took place in small groups (pairs or threes) and was involved solving authentic problems and tasks for the study of the selected topic. During the course the building of a scientific subject using the Science, Technology and Society (STS) approach is demonstrated to students while focusing on the process: collecting and organizing information, mapping the topic, and planning activities. It also emphasizes the solving of everyday life problems through research for the development of inquiry skills and the adaptation of scientific-technological changes, such as:

1. Water Lab: Laboratory dealing with water. Students were asked to perform experiments, summarize, and draw conclusions.
2. Tiltan: Science kit that includes scientific equipment which enabled performing physics experiments related to everyday life. The activities included participation in the forum, forum management, attending meetings, and learning synchronously - asynchronously via the course website. Each student was required to conduct a study discussion group on the topic chosen and participate in discussion groups managed by colleagues in the course.

The online course was based on the Highlearn platform which enabled ICT learning synchronously through InterWise. The course included peer teaching: students conducted group discussion and peer feedback; individual monitored learning.

All students were instructed by the lecturer in developing their project and self-learning: students read articles and sent comments on tasks related to them. At the end the students tried the activities in class and reflected on their experience. A variety of learning tools was provided, using an interactive site that contained the information (presentations, articles, videos, recordings of lectures and exercises, handouts, forum, chat, survey, testing, training, and announcements), which allowed learning through discussion groups (forums) and asynchronous audial discussion. The course evaluation included formative assessment, including peer review and teacher evaluation, and summative evaluation, which included scores on assignments and a final grade for the work.

The study population

The five-year study population included 121 students in their second year in the Early Childhood program: participants in the online course "Science Teaching for Early Childhood," 25 "LD students" (with learning disabilities, diagnosed as ADHD - Attention Deficit/Hyperactivity Disorder), 28 "excellent students" (enrolled in the Honors program including top 10% students` academic achievements), and 68 "average students" (not identified as LD or excellent). Every course included about 20 students, including representatives of all three groups, and was taught by the researchers.

Research tools

Pre–Questionnaire: The questionnaire included 12 closed questions and three open questions. All of the closed questions included 3 or 4 choices, most of them rated on a Likert scale. For example, when asked "how important was your relationship with the Instructors?" respondents had to choose between “to a great extent," "moderately," or" not at all.” To assess the degree of communication with the online course instructors, the students had to choose between "more\equal\less” than the relationship with regular lecturers. Questionnaire items related to the computer skills of learners, assessing their individual learning ability, the importance learners attached to communication with lecturers and students in the course, their assumptions for the online course communication they will attend, their work habits, and their degree of satisfaction with the online course in various areas.

Post-Questionnaire: The questionnaire included 15 closed questions and three open questions and was similar in its structure to the pre-questionnaire. Some of the questions of the pre-questionnaire also appeared to test if students' attitudes changed after the online course. Additional questions related to the students' evaluation of their individual learning and to communication with others in the course. Additional questions related to satisfaction with tasks and activities, the degree of participation in discussion groups, and their evaluation of unique elements of online teaching. For example, "To what extent does knowledge sharing among forum participants contribute to learning?" Possible responses included "to a great extent," "moderately," or "not at all."

Interviews: Semi-structured interviews, lasting about forty-five minutes, were conducted with nine students - three from each of the three groups - based on questions set in advance, which enabled an open dialogue with the interviewees. The interviews were conducted, recorded, and transcribed by the researchers.

The research process

The five-year study was conducted by the researchers, who were careful to be uniformed about which group the students belonged to ("LD", "average", and "excellent"). The Pre- and Post-

questionnaires were completed at the beginning and end of the course by participants via the Internet. The students' course grades were determined by evaluating the following components: (1) Student activity and tasks performance, (2) participation in forums and chat rooms, (3) student feedback in their peer forum, (4) information search in the chosen topic, (5) building learning centers, and (6) project summary. Data was collected and analyzed separately each year. After the five years of the study, the results were combined and analyzed to compare the three groups.

Analysis

Descriptive statistics were used to analyze the results of the questionnaires using SPSS software. To check if the students' responses from the three groups, "LD," "average," and "excellent," differed in various aspects of the course, an ANOVA test was conducted to examine differences among the three groups regarding their perceived contribution of the online course to their learning. In addition, a multivariate analysis was made between the three groups. Naralizer software was used for content analysis of in-depth interviews, organizing the data according to criteria defined by the researchers in advance or during analysis. In this study, four categories were defined in advance (see sections 1, 2, 4 in Findings) and two additional categories emerged from interviews with students (see sections 3, 5 in Findings).

Findings

Several aspects of the perceived contribution of the online learning course were reviewed in: (1) Students' self-learning ability and participation in the online course; (2) Students` satisfaction with the online course activities and skills; (3) Suitability of the online environment for learning; (4) Online course interaction; (5) Online course availability; and (6) Online course student achievement.

1. Students' self-learning ability and participation in the online course

Figure 1 shows the LD, Average, and Excellent students` evaluation of their self-directed learning abilities. As can be seen in the pre-questionnaires, the LD students reported lower levels of self-directed learning in comparison to the average and excellent pre-service-teachers. However, in the post-questionnaire they reported higher levels of self-directed learning in comparison to the others. The biggest improvement can be seen in the LD students' self-evaluation.

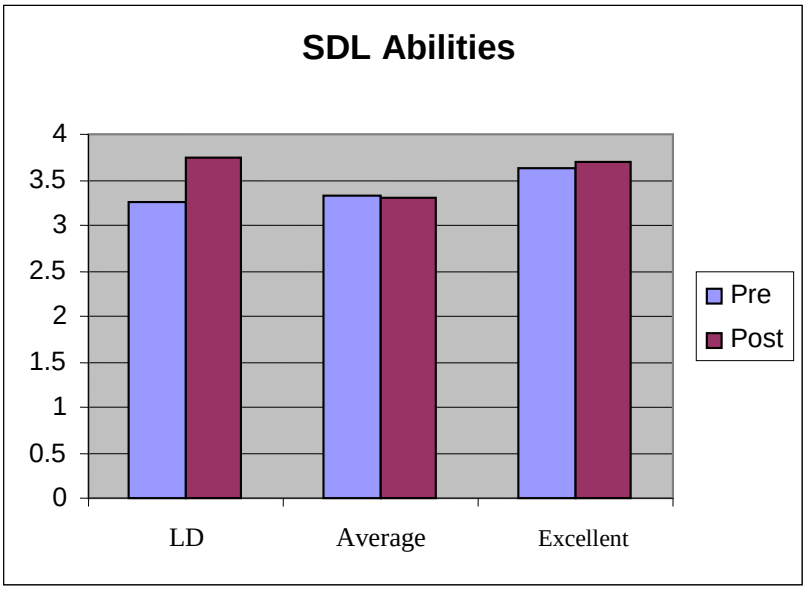

Figure 1. Students' Evaluation of their Self-directed Learning (SDL) Abilities: LD, Average, and Excellent students (N=121)

The interviews clarified the perceived contribution of the online course to the students' self-learning ability. As one LD student, N, said, "In the online course I needed to learn independently, all by myself. At first I had difficulties in information processing, but I had to manage, so I overcame. I managed in-time planning, I learned to take responsibility, and I feel much more self-disciplined."

An excellent student, A, said, "Although I am a self-learner and I know how to learn by myself, I mainly learn from my lecturer in a traditional lesson. The online course contributed to my self-learning skills, responsibility, and time planning."

And an average student, T, claimed, "Self learning is a necessary condition for online learning. Students who need to see and hear their lecturer can`t be online learners."

Figure 2 shows the differences between the three groups in lesson participation. The excellent students reported equal participation in an online course and in a traditional one. The average students reported lower participation in an online course than a traditional one, while the LD students reported higher participation in an online compared to a traditional course. LD students' self-reported participation in the online course was virtually equal to that of the excellent students and is not statistically significant.

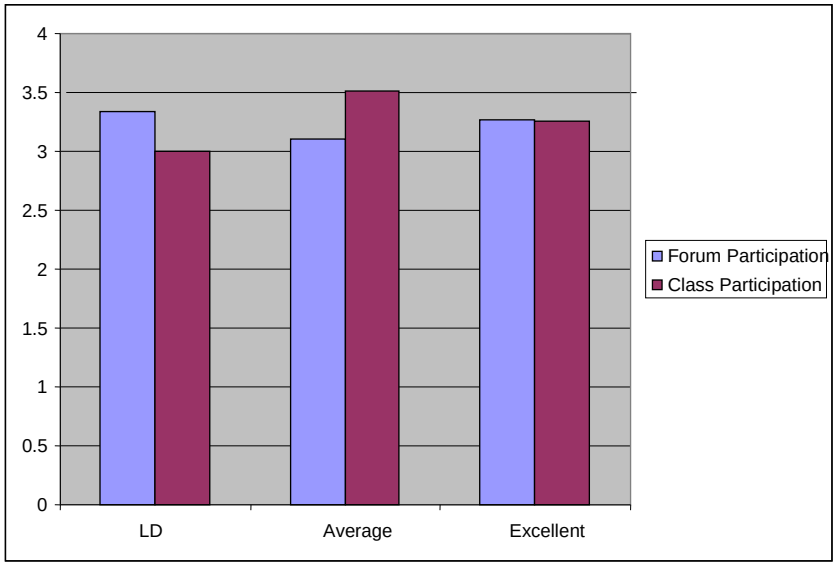

Figure 2. Students' Evaluation of Participation Level in a Traditional Course and in an Online Forum: LD, Average, and Excellent students (N=121)

2. Students' satisfaction with the online course activities and skills

The post-questionnaire required students to evaluate and rank the activities conducted in the course and the skills they acquired, including planning and execution processes and laboratory water lab, forum management and participation, and an authentic task activity.

The analysis distinguishes ($p < 0.05$) between LD student group and the other two groups on the following activities: an authentic task, water lab, and forum management (Table 1). A multivariate analysis in the form of discriminant analysis performed on the data revealed one significant function which differentiated between the LD students and the other groups. The results are presented in Table 1.

Table 1. Structural Coefficients Discriminating between LD Students and the Other Groups (N=121)

The Subjects	Structure Coefficients
Authentic task	.47***
Water Lab	.47***
Forum M	.29***
Forum P	.199
Mabat	-.137
Science kit	-.044
Eigenvalue	.69
X^2	27.72***
Wilks-lambda	.41
Centroids:	
LD	-1.43
Average	.46
Excellent	.76

***P<.005

A detailed assessment of LD, excellent, and average students' standard measures distinguished (an authentic task, water laboratory, and forum management) is shown in Figure 3.

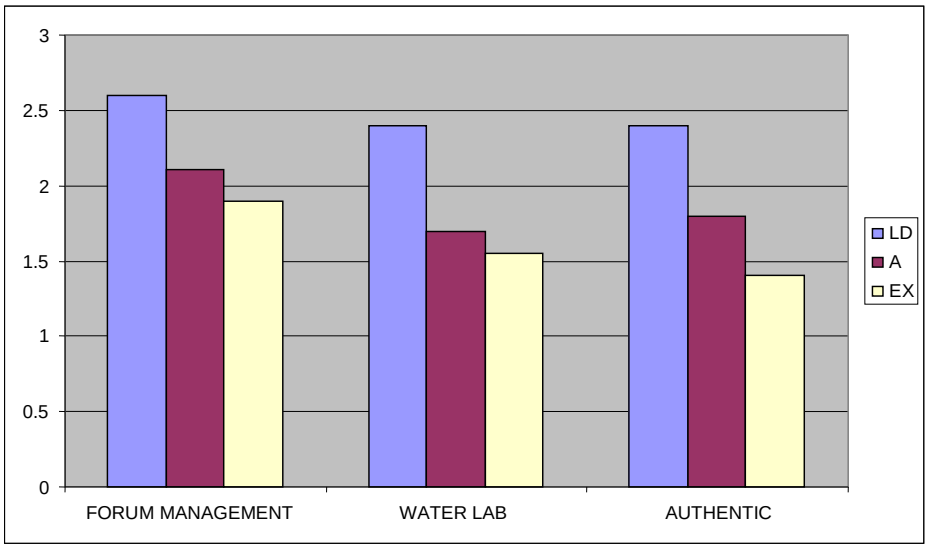

Figure 3. Students' Evaluation of Forum Management, Water Lab, and Authentic Task: LD, A-Average, and Ex-Excellent students (N=121)

Figure 3 and Table 1 show higher satisfaction expressed by the LD students compared with their peers regarding the three distinguished indices: an authentic task, water laboratory and forum management. Moreover, it can be seen that the average students' evaluation is also higher than that of the excellent students in all three indices, although the difference is not significant.

3. Suitability of online environment for learning

To study the contribution of online tools (tools for synchronously teaching, voice supported software, multimedia, forums, online practice, and messages) to the learning of students with diverse background (LD, excellent, and average students), the researchers relied on these tools: questionnaire, criteria defined in the interview, and other criteria that emerged from the content analysis of personal interviews.

(a). Synchronic lessons' adjustment for learning:

During synchronous lessons, students could determine the learning place for themselves, at home or elsewhere. They were able to see slides and exercises the professor presented and hear the voice of the instructor and other participants. Students could take part by asking questions, express opinions by voting, and participate in the discussions. The students were able to listen to recorded lectures in their spare time.

Students noted the following synchronic learning benefits:

1. Synchronous instruction allows immediate interaction with the teacher and peers:

"A synchronous lecture is important. It really helped me to have immediate response, and I like an immediate response. It is even well than a traditional lesson in which I almost do not participate and do not ask anything" (N.).

2. A synchronous learning environment allows privacy for learning, supporting learners with learning disabilities who are sensitive to environmental disturbances:

"It's like in a synchronous lecture. I was sitting in a lecture class with everyone, but it's neater and less noisy. This is important, particularly for students with attention deficit problems. Noise takes you out of focus" (S.).

3. Learners could return to recorded materials for extra training according to their needs. This advantage is particularly crucial for LD students and was noted as supportive of learning: "I could hear the whole lesson over again, just the teacher talking to me. That is as if you are again in class, if you did not understand something, if not the material was not provided, you can return to the recorded lesson" (S.).

Likewise, excellent students and average students noted the advantage of the recorded lessons: "I participated at home always. Sometimes a move from the computer or something interfered and I had to hear it, it bothered me. By using the recorded lesson I could listen again, even for cases where I was absent from class or if I were unable to participate synchronously…."(H.).

4. Synchronic learning defines the time frame within which a learner is required to encounter learning lesson. The possibility of designing the learning contributes mostly to LD students.

"I could read the lecture in advance, prior to the synchronic meeting, so I knew exactly what questions to ask. I was ready; it's an advantage over traditional lecture….It is the only place you get an immediate response. We need much more synchronous sessions" (T.).

Several of the excellent students noted the specific time frame as an advantage:

"I think we need more synchronous lessons… more frequently. There is a kind of framework and time frames, which helps us not get lost" (R.).

(b). Asynchronous lessons' adjustment for learning:

Students performed tasks and responded to their colleagues in an asynchronous forum. They could do it any time they chose, up to the date set for performance of the task. There was no significant difference between the three groups regarding the degree of their participation neither in the forum nor with their degree of satisfaction with participation in the forum (Table 1). However, significant differences were found between the LD students and the other two groups regarding their level of satisfaction with the task which they had to manage (see Table 1 and Figure). The LD students expressed greater satisfaction compared with their counterparts with the

discussion group management and sharing ideas with peers and lecturers. This finding was reinforced in interviews with LD students:

"Members' participation in the forum helped me run the forum and do well in my personal mission. I saw sequences of peer teaching, I learned from colleagues` ideas, and I used the materials of the members. I consulted with colleagues and lecturers, which helped me to a great extent" (T.). In contrast, average and excellent students reported that participation in the discussion group did not help them, and they were able to cope with learning individually and independently, without the participation of colleagues or professors: "I didn't participate much in the forum. Requirement to respond to five colleagues is exaggerated" (R.).

The essence of the discussion group is teamwork, designed to clarify questions and discuss concepts and content. The researchers feel that online course discussion groups can help provide the personal and social support of colleagues and thus were valuable for the majority of LD students.

4. Online course interaction

The degree of online interaction between the students themselves and with the lecturers was tested in three aspects: (1) Students' assessment of the expected interaction in the online course (pre-questionnaire), (2) The importance that students attribute to the interaction with participants in the online course (pre-questionnaire), and (3) Students' evaluation of the actual degree of interaction took place in the online course (post-questionnaire).

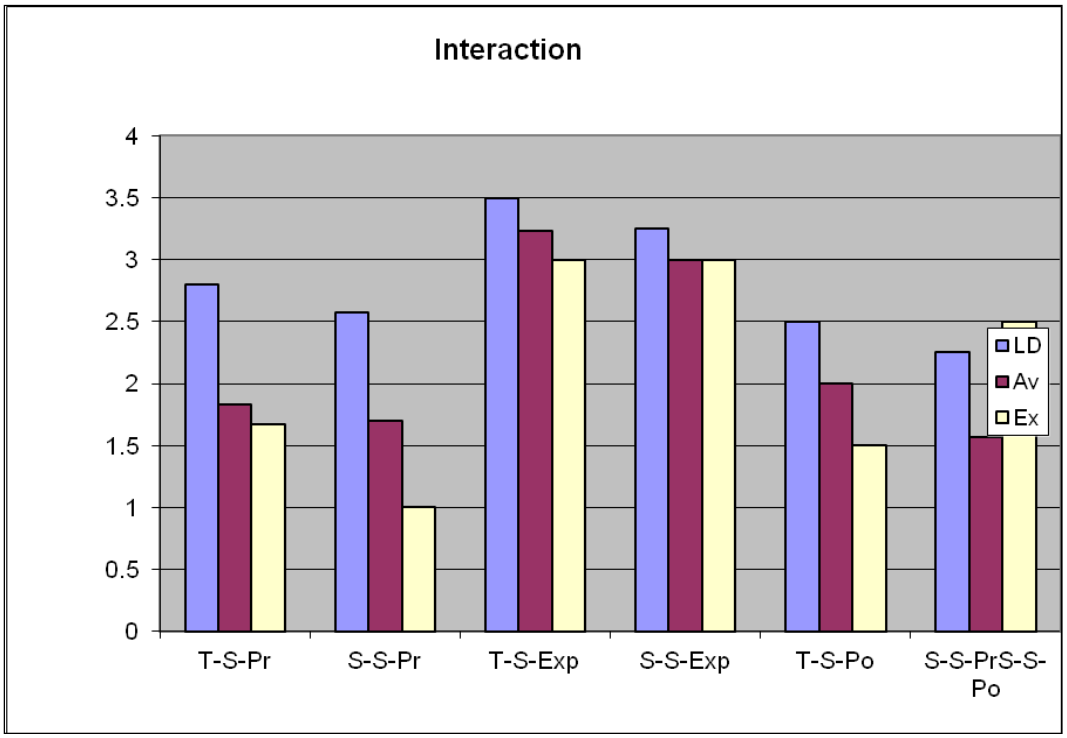

Figure 4. The degree of online interaction between the participants: before (Pr) and after (Po) the course, between students (S-S), and with the teacher (T-S), and their expected interaction (Exp) before the course started: LD, A-Average, and Ex-Excellent students (N=121)

The findings indicate no significant differences between the three groups. All students attach great importance (over 3.3) to interaction with lecturers and among peers. Everyone expected a moderate degree of interaction (less than 2) in the online course, and at the end of the course all reported a moderate degree of interaction (less than 2).

The graph also reveals that LD students ranked the importance of the degree of contact, the expected degree of contact, and the degree of actual contact higher than the excellent or regular students. From tracing the discussion groups and from interviews with students, it can be said that the LD students reacted to discussion groups more than their peers and they demanded and received a larger number of responses from colleagues and lecturers. As one of the LD students said, "…I had time to prepare my response properly and to send it in my time. I felt more confident with my answers."

Most LD students prefer more intensive interaction with the lecturer than their peers. For example: "I could contact the lecturer at any time and every time, not like a regular class teacher I see only once a week, during class. That the course contributes to the self-learning, while processing information. Initially, I had a problem and then I learned and developed. I learned to use more collaboration, more contact with professors, to ask relevant questions. These are questions that make thinking "(N.).

The online course interaction allows topic discussion while each of the students presents their opinions and reactions, without any preferential treatment or modification and without distracting irrelevant stimuli (such as looks, dominance in class, or unusual behavior). The fact that online course participants were treated equally, without discrimination among the groups, was reflected in the words of an excellent student:

"There were students who responded more or less, but since everyone has to respond there is uniformity. In a regular class there are always those who stand out" (N.).

In summary, in an online course students can choose the extent, date, and nature of the interaction with other participants. Online course interaction is personal; allowing an intimacy between the students and lecturers and among the students, and students saw it as one of the strengths of the course.

5. The online course affordances

Interviews with students revealed additional features of the online course that can be grouped into two categories: Flexibility and Knowledge Construction.

(a). Flexibility in time and knowledge: Flexibility in the online course allowed time management and was reflected in access to information and in students' selection ability. This flexibility allowed students with learning disabilities to plan learning and the availability of information at the appropriate dose for their attention spans and concentration limitations. Hypertext was another tool mentioned by the LD students as contributing to the teaching and learning, providing instant answers to questions that arise during the study and completing their knowledge gaps. Hypertext supports knowledge construction in a complex, non-linear, and changing environment based on the cognitive flexibility theory. But this flexibility in selecting the content could also lead to a lack of focus in the learning process (Brunvand & Abadeh, 2010).

The special structure of the course described here assists students to focus on the task until completion. The fact that the course is constructed of small teaching units contributed to target specific learners' attention to relevant content while simplifying the route to finding information. This structure helped all the students, especially those with learning disabilities, who prefer a long process-phase, including memorization, training, and practice (Heiman, 2006). The excellent students also emphasized that flexibility was the most successful aspect of the course, since it enabled a faster pace of learning and individual time management.

The findings showed that the online course enabled all students to take responsibility, to devote the time necessary for learning, and to develop self-discipline that led to learning. As a LD

student said, "The online course contributed to my learning. The fact that I had to sit alone with myself and process information…developed my own learning. At first I had problems, and then I learned from the questions that require thinking. I feel that I have evolved" (N.).

(b). Conditions for knowledge construction: Transfer of responsibility to the learner: Online tools have changed the place and role of the teacher by reducing dependency on the teacher as a source of knowledge and by enabling social interaction in the learning environment. These were reported in the literature as supporting construction of knowledge (Beldarian, 2006; Simpson, 2006).

Thinking and learning discourse: The LD students reported the value of a study group found in the online forum in meeting their needs. Even the excellent students, who tend to learn independently in a traditional course, enjoyed the benefits of group discussion, even though they did not choose it. Indeed, despite their differences, the various students participated in the discourse, contributed and donated, and showed responsibility for the online learning process (c.f. Rotem and Peled, 2008), which became effective, high quality, and purposeful.

Customized personal support: All of the students received personal instruction tailored to their needs. Factors identified in this study as contributing to success in learning, such as self-learning, interpersonal communication, group discussion and discourse, and flexibility in time, figure in advancing learning (Bray, Aoki, & Dlugosh, 2008), especially when they fit the manner of performance and style of thinking and learning of the learner (Brunvand & Abadeh, 2010; Dwyer& Moore, 2001).

6. Students' achievements in the online course:

Students' grades were given by lecturers at the end of the course and were based on the assessment of the following activities: participating in forums, task performance, forum management, and quality of the final project. The findings showed that the LD students' average grade was higher (89) than their counterparts, the excellent (87) and average (80) students. No comparison was made between students' grades and scores in the online course and traditional courses.

Discussion

The advantages of an online science education course to students of diverse backgrounds (LD students, excellent students, and average students) are presented in this study. The ongoing five-year findings pinpointed the advantages of the online course to all three groups of students, yet it carefully reports a slight but explicitly marginal advantage in the LD students` achievements in comparison to the excellent and average students. The unexpected LD students` achievement is not in line with previous research (Kwesi, 2002; Woodfine & Wright, 2008). The LD students' success was expressed by their final course score given by lecturers as well as the improvement in the students` evaluation of their own self-learning ability following the online course, their satisfaction level regarding content learned, participation in discussion groups, and performance on tasks. A significant difference was found between the LD students and their peers regarding the authentic task, the water lab, and their forum management. Dealing with everyday authentic subjects, as well as the opportunity to conduct an online study forum, was particularly significant for the LD students.

Moreover, the LD students reported higher participation in the online course in comparison to traditional ones and high interaction with the lecturer and their classmates. A striking result indicating the accessibility of online learning for disabled students was also pointed by Badge, Dawson, Cann & Scott (2008), regarding disabled students using significantly more "user control" features than the non-disabled group while actively seeking out information by selecting appropriate portions of the material (Badge et al., 2008).

Similar benefits of interaction and collaborative learning in online learning are also reported in the literature (O'Neil & Fisher, 2008; Shea, Pickett, & Sau Li, 2005), while the low benefits from interaction involving excellent students in this research contradicts others (Olszewski & Lee, 2004). These differences may result from various characteristics of the courses; for example, teaching methods of the online course (working in pairs, cooperative learning, peer review), course content (theoretical issues or authentic topics related to everyday life), online tools (forum, chat, practice, videos, simulations, audio lecture, learning through texts), type of task required (reading, forum participation, hands-on lab) and the assessment of learning (formative assessment, summative assessment). When online learning is used just for knowledge transfer and mainly as a communication platform, the online learning advantages that lead to the success of the learners are likely to be minimal (Means, Toyama, Murphy, Bakia, & Jones 2009). In this case, the excellent students are capable of coping with the educational content on their own and therefore rarely use discussion groups or supervisor support.

In contrast, using a variety of online tools in online courses probably contributes to the learning of students from all backgrounds, and especially LD students, as was described in this research. The online tools used in this research were synchronous classes using audio and visual means (supporting primarily the LD students), students forum management (supporting cooperative learning and peer review), computerized follow-up submission of assignments (allowing tasks to be divided into small units and helping students with time management), online documentation of the products (continuous and intensive formative assessment), forum support (for questions, guidance and assistance).

In an online discussion forum, discourse lies at the heart of knowledge construction since learning is social, collaborative, consensual and negotiated. Recognition of learning discourse as a meaningful key component in knowledge construction (Teo & Webster, 2008) is also described by the Model III theory, which refers to online tools under the term Web 2.0 (Kesselman & Tobin, 1999; Rogoff, Matsuov, & White, 1998).

Students describe unique features of the online course as flexibility and choices in utilization of the information and in time management; interaction, including the availability of cooperative learning and peer review; duration of lessons determined by the learners; and knowledge construction based on the transfer of responsibility to the learner, thinking and learning groups, and individual and customized learner support.

Adjusting instruction to students from different backgrounds is a challenge facing colleges and schools of education. The combination of excellent students with LD and average students intensifies the challenge. However, the encouraging findings of this study suggest that an online course contributes to the education of students from different backgrounds (Shonfeld, Hoter, and Ganeyam, 2013). To establish the trend apparent from this study's findings, more online courses should be examined and the sample increased. Other methods (such as observation, thinking aloud, report analysis, and report communication tasks) should be examined to deepen the assessment of online course effectiveness.

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