Collaborative learning activities and their substantial role in the cognitive development of children with Learning Disabilities

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ABSTRACT
The present paper intends to gain a better understanding of the characteristics directly associated with collaborative learning given that it actually entails a cognitive development among students with Learning Disabilities. These students undoubtedly face difficulties in both developing cognitive abilities and acquiring new knowledge. They also live under a constant anxiety in relation to their behavior refinement, the strengthening of their communication skills and finally the establishment of solid relationships with their surroundings. This paper further provides the repertoire of types of collaborative learning activities which are considered suitable for learning purposes directed to students with impairments. Finally, this paper pinpoints that using Information and Communication Technologies and multimedia contents in collaborative learning environment raise students' interest in learning and boosts attention spam.

KEYWORDS
Cognitive development, Learning Disabilities, collaborative learning activities, Information and Communication Technologies (ICT's)

RÉSUMÉ
Le but de cet article est d'approfondir la compréhension des traits directement liés à l'apprentissage collaboratif, étant donné qu'il entraine le développement cognitif chez les élèves ayant des troubles d'apprentissage. Evidemment, ces élèves sont confrontés à des problèmes en ce qui concerne le développement des capacités cognitives et l'acquisition de nouvelles connaissances. En outre, ils vivent dans une anxiété permanente par rapport à l'amélioration de leur comportement, le renforcement de leurs compétences en communication et finalement l'établissement des liens solides avec leur entourage. Par ailleurs, cet article fournit le répertoire de genres d'activités d'apprentissage collaboratif jugées pertinentes aux fins de l'apprentissage des élèves ayant des déficiences. Enfin, cet article souligne le fait que l'usage des Technologies de l'Information et de la Communication ainsi que du contenu multimédia dans un environnement d'apprentissage collaboratif suscite l'intérêt chez les élèves pour l'apprentissage tout en accroissant leur capacité de concentration.

MOTS-CLÉS
Développement cognitif, Difficultés d'Apprentissage, Activités d'apprentissage collaboratif, Technologies de l'Information et de la Communication (TIC)

INTRODUCTION

Cognitive development theory origins in Piaget (1995) and Vygotsky (1978). Vygotsky (1978) in particular, has emphasized learning social genesis and has claimed that learning is achieved more effectively through interaction between peers, involving verbal discussions and peer observations. Moreover, Smith and MacGregor (1992) have stated that learning is the outcome of social interactions. They have converged to relevant assumptions about learning; that, according to their premise learning is an active constructive process that depends on rich context. The learners are diverse and inherently social and they have affective and subjective dimensions. Therefore, teaching and learning are shifting away from the typical teacher-centered model to the most preferable student-centered type as far as collaborative learning is concerned. Within this framework, learning is best accomplished by engaging students in constructing knowledge through observation, acquisition, generation, manipulation and eventually structure of information (Alavi, 1994).

In this article, readers have the opportunity to browse a brief selected review of contemporary research papers related to the key role of collaborative learning techniques in promoting and establishing both cognitive development and performance of students with Learning Disabilities (LD). To set the frame of this topic, a thorough overview of cognitive theory focused exclusively on LD is offered. Apart from that, what is briefly described further down concerns the process through which students with special education needs succeed in developing cognitive skills. Then, the most common factors, which negatively influence students' cognitive ability to solve problems effectively, are analyzed. Finally, this review outlines significant findings regarding the great impact of collaborative learning methods on students with LD as well as on their intellectual development. This fundamental knowledge will certainly reinforce teachers', parents' and other school practitioners' ability to integrate peer learning methods in their teaching methodology with a view to offering more targeted and effective instructional opportunities to their students with LD.

THE COGNITIVE APPROACH IN THE FIELD OF LEARNING DIFFICULTIES

The National Joint Committee on Learning Disabilities (NJCLD) (2009) defines the term "Learning Disability" as: A heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to Central System Dysfunction.

Whenever cognitive activities have been incorporated into the learning process syllabus they have always offered important interpretations of the term "heterogeneous" referred to the sphere of Learning Difficulties. More specifically, when it comes to studying the intellectual development of a child diagnosed with LD it has become obvious that such a development lacks in following the ordinary stages and processes that normally lead to knowledge acquisition. Nevertheless, the development of such LD cases is rather based on more transient processes, vague and tacit, through experience systems. Within this experimental system, the child transits from the stage of "idiots" to that of the "expert" stage via an incessant procedure of controversy, transitions and adjustments (Mponti, 2013).

According to the cognitive approach, children with LD manifest poor school performance, insufficient academic skills, while at the same time their mental capacity is at the upper or middle point (Sulaiman, Baki & Rahman, 2011). Indeed, cognitive theorists clearly describe LD, as problems that affect the brain's ability to receive, process, analyze or even store information (Mponti, 2013).

In addition, because of the limited knowledge capacity, children with LD face a variety of problems in the same way each time, regardless of the final outcome. For example, if a student solves a problem incorrectly once, s/he keeps repeating it regularly. This happens because children with LD are generally rigid in their thinking and they also have difficulties in using or testing different problem-solving methods (Sulaiman, Baki & Rahman, 2011). In other words, they lack in flexibility regarding their thinking and thus they manifest a way of thinking within the confines of a particular concept that they are familiar with. The process of learning is carried out by testing methods and providing appropriate feedback, by rejecting the wrong methods and by adopting new and more effective ones (Mponti, 2013).

At the same time, their knowledge is burdensome. This simply means that the child can solve the same problem, sometimes correctly and sometimes not. In this case the learning process is progressive. The child tests a number of methods until s/he results in the correct one. Then, the moment the child comes up with the right method, s/he gets used to making use of it from then on (Mponti, 2013).

As far as concentration is concerned students with LD are very easily distracted and very often lose their concentration (Mulrine, Prater & Jenkins, 2008). As a result, they develop with delay and to a lower degree in relation to the general typical student population, the ability to focus their attention on their cognitive tasks (Conte, 1998). In fact, information processing theory originally outlined the vital role that attention plays in both the conception of a stimulus and its transfer to memory (Korkman & Pesonen, 1994). More specifically, the stimulus is conceived by the receptors of the sensor organs and is transferred to the short-term memory. After a very short period of time, it will be either transferred to the longterm memory for further encoding or even storing or it will be discarded from the cognitive system (Atkinson & Siffrin, 1968). Additionally, students with LD display a proclivity to lack of stability and they cannot reach the level of superior form of information processing due to their difficulty in implementing cognitive strategies (Mponti, 2013). Consequently, attention interacts intensely with memory ability and, as a result, they both affect students' performance in the cognitive task (Hayes, 1996).

Finally, children with LD come across "disruptions in one or more of the psychological functions or processes required for school learning" (Dockrell & Mc Shane, 1993), which are called "executive functions". Executive functions are a set of cognitive processes which are necessary for the cognitive control of behavior and include functions such as attentional control, cognitive inhibition, working memory and cognitive flexibility (Miyake et al., 2000); processes which are related to perceptual, kinetic, linguistic and mnemonic functions and do affect learning (Mponti, 2013). Executive functions are strongly related with problem solving and reasoning, since they are usually activated when there is no guidance from external representations and when there is a strong possibility for mistakes, since the problems are completely new and difficult for the solver (Chuderska & Chuderski, 2009) in a totally new and unfamiliar context (Cragg & Gilmore, 2014). Current research has shown that executive functions like working memory and cognitive inhibition are strong predictors of academic performance in mathematics and physics from elementary to high school (eg. Blair & Razza, 2007) and of socializing in early childhood (Razza & Blair, 2009). Executive functions are impaired in disorders like attention deficit hyperactivity disorder (Malenka, Nestler & Hyman, 2009), autism (Solomon, 2007) and a number of other central nervous system disorders, which are strongly associated with LD.

All the aforementioned theories have therefore highlighted the necessity for both developing and optimizing new teaching methods as well as resorting to a more meticulous examination of a series of pedagogical teaching interventions that can undeniably ensure that cognitive development of children with LD becomes a reality.

COOPERATIVE LEARNING

The term 'Cooperative Learning' (CL) refers to those educational methods in which couples or small groups interact so as to achieve a common goal (Bigge, 1990). The ultimate goal of this collaboration is to maximize pupils' personal knowledge by smoothly interacting with the other members of the group who are working for the common benefit (Johnson, 2001). At the same time, teachers who take advantage of targeted collaborative techniques seek to eliminate unintelligible, social and educational prejudices that favor school competition (Pineteh, 2012; Robin, 2008).

Johnson, Johnson & Holubec (1990) aptly describe "Collaborative Learning" as the learning procedure achieved through organizing the classroom in small groups with the aim of achieving and maintaining a creative collaboration among students. The ultimate target behind this technique is for the participants to optimize not only their own pace of learning but also the way all the group members acquire knowledge. Indeed, the assignment of co-operative activities by the teacher intends to foster and establish beneficial outcomes for both the members individually and all the group members as a team.

They also point out that in the context of LD any trace of competitiveness among pupils is eliminated since they act out as a group with a common ultimate goal, for which all members have to cooperate harmoniously. Harmonious cooperation on the one hand, and strengthening of members' social relations on the other, constitute a basic philosophy of this teaching approach. Besides these attributes, this teaching method holds the belief that in order for the team to progress there must be mutual trust and interest among its members who should not only share, but they should also bear the responsibility for any failure (Johnson, Johnson & Holubec, 1990). In this perspective, Alavi (1994) supports the argument that teamwork reinforces learning through problem solving techniques which are a means to extend, test, and refine mental models until they become effective and reliable.

According to Slavin (1990), collaborative learning fosters social support and encouragement for individual learning. Furthermore, it increases self-esteem; this is so because within the learning community, its members cooperate for a common goal and adopt pre-agreed roles. This contributes to theirs developing a sense of shared responsibility, of mutual support as well as theirs cultivating a friendly climate that indeed encourages learning. Such a working environment favors socialization of its individuals and can actually trigger particularly beneficial effects on those members who, for various reasons (e.g. reduced self-esteem), hesitate to express their views. Moreover, through collaboration students acquire additional learning incentives. The pupil's organization in learning communities with a view to working together and achieving common intellectual goals is perfectly suited to their nature and needs, while, on the contrary, their isolation inhibits their inherent tendency for communication and social interaction. For these reasons, the work of individuals within a predetermined learning community which follows the CL techniques, can by itself be a powerful and unprecedented motivation for learning, given that it helps students develop organizational and work-related skills within groups.

It is through collaborative learning (Johnson, Johnson & Holubec, 1990) that students realize how directly connected they are to each other in such a way that no one can respond to their role successfully without being supported and assisted by the other team members and that the success of everybody depends primarily on the mutual contribution of everyone within the group. This entails development of a sense of shared responsibility, mutual support as well as cultivation of a friendly climate that further reinforces learning. In the context of student collaboration and solidarity, one student contributes to the success of the others by providing assistance and support. This learning method promotes oral explanations on how to solve problems, disseminate knowledge to one another, control understanding from one

another, discuss the concepts learned and link the current knowledge to the previous one. Additionally, team work develops a strong sense of responsibility among the members in their attempt to achieve their goal and every single student feels responsible for their personal contribution to the team. Finally, children and adolescents form small groups with common goals (e.g. play, have fun) and because of this harmonious coexistence, they become filled with a lot of emotional satisfaction. In fact, organizing pupils in learning communities with a view to working together, so as to realize common cognitive targets is fully in line with their nature and needs, whereas an individual way of living and working on their side violates their innate proclivity for interaction and communication. At the same time, the teacher gains a better understanding of the class as well as the students by using application tools firstly for repetition and then for evaluation (Papathanasiou & Manousou, 2011).

COLLABORATIVE LEARNING ACTIVITIES

With respect to the specific characteristics directly linked to the collaborative learning approach, it is recommended that the classroom be appropriately configured to determine harmonious co-operation among small student groups as well as facilitate a smooth and flexible movement on the part of the teacher among the teams, while the educational material is organized with a view to meeting the teaching purpose of the lesson (Papadopoulos, 2012). Furthermore, in this way, the academic goal is explained in detail to students, while a serious and systematic attempt takes place so as to bridge the students' expected academic gaps and, as a result, to establish steady and solid interdependence. This ensued solidarity among student groups, in fact, is a key factor as it triggers group commitment to producing a single learning product. Besides, the groups are responsible for coming up with and organizing the learning material in the syllabus and for gathering all relevant information. As for the groups, it is their members that determine the role of each member separately. In fact, according to Westberg and Jason (1996), it is extremely useful for the co-operative teacher to maintain a checklist for preparing group cooperative skills. In this sense, students feel freed and optimistic at their effort to make the best use of these teaching methods.

As Koutselinis and Theofilidis (1998) aptly point out, the academic, emotional and participatory sectors are developing simultaneously and effectively. More specifically, as far as academic performance is concerned, they argue that the spiritual horizons of each member are broadened because of the regular confrontation of their ideas within the group. In addition, within the group, the learning process evolves in a more systematic and smooth way, urging students to engage more actively in it always in accordance with their individual endurance and capability. At the same time, all students are actively involved, by examining different topics, by presenting one's own way of thinking or by explaining specific meanings of texts. These attributes actually conduce to developing the students' speech, while, at the same time, strengthen their ability to understand the written discourse. Through collaborative learning, both power and authority of the instructor dramatically recede and s/he, instead, empowers small groups, which are very often provided with more open-ended and complicated exercises. Rockwood (1995), equally supports the premise of following more structured, cooperative learning for basic knowledge, which is reflected in success-oriented courses and is based primarily on the liberal approach of open collaborative learning for a higher academic level and much less for basic knowledge content. Other terms are also used in conjunction with closed collaborative learning and open collaborative learning; namely, group learning, problem-based learning including guided planning, case studies, simulations, peer guidance including supplementary guidance, written talk to friends, workshops in

Mathematics, discussion groups and seminars, learning communities and workshop (Cooper & Robinson, 1998; Smith & MacGregor, 1992).

Nowadays collaborative learning is technically supported and methodologically reinforced by computer systems and therefore ends up being very efficient as well as promising. Computer-assisted collaborative learning further enhances and motivates students with LD, provided that it is implemented effectively, as it offers a wide variety of opportunities for expression, creativity and interaction among the participants during the educational process (Pozzi, 2011). Taking into consideration that technology has paved the way for overcoming obstacles related to the mandatory physical presence of the teacher-student parties in the same space or even time, one can justifiably jump to the conclusion that this allows a widespread use of digital tools such as e-talks, teleconferences, e-mail, whiteboards, chat rooms, HTML-pages, (Pozzi, 2011). Consequently, all these innovative and challenging perspectives amply offered by ICT's, render them a powerful tool in the hands of education, on account of ICT's wide span of usage, which allows them to be effectively implemented in many different situations and subject-matters.

In particular, incorporating teleconferencing as a means of instruction into educational procedure has proven to have satisfactory results in students' performance and collaborative learning (Papadimitiou et al., 2007). Indeed, Chambers (1997), in his study dealt with examining interactive video (IV) in connection with students facing LD, reached the conclusion that these students were able to raise their self-esteem, develop a sense of ownership, work collaboratively and develop their language skills through technology-assisted discussions. For certain special needs, though, students, who normally had a difficulty in concentrating, gradually realized that the video conferencing context entailed a further advantage in that it not only acted as a focused digital *locus*, itself, but it helped LD students organize the way they used to think and act, as well (Thorpe, 1998).

What is more, long-lasting research has shed light on how much the rapid boom of technology and its dynamic intrusion in education have assisted students in ameliorating their academic skills. Specifically, research has emphatically highlighted that students with LD who have involved in word processing interventions (eg. text-to-speech including complex computer-based interventions with a primary text-to-speech component, speech-to-text, word processing including spell or grammar check, multimedia and hypertext, and smart pens) have greatly improved their writing skills (Perelmutter, McGregor & Gordon, 2017). Moreover, in a classroom where collaborative and collective work takes place, the team members discuss the topic under examination, forming in this way, a more overall and to-the-point view of it. Then, at their own pace they type it on the Word, print it, review it, write down their remarks, and, as a result, the final outcome is definitely much better than the original one (Mumtaz & Hammond, 2002).

Another intriguing scientific research has taken place in schools of secondary level of education in Greece and intending to thoroughly delve into the effects arisen by collaborative learning techniques when it comes to integrating ICT's and, more specifically, the Concept Mapping Software on improving the writing skills of ADHD students (Andreou & Riga, 2013). Riga and Papayiannis (2015), also conclude in the same study that students express an innate preference to work in groups rather than individually. Moreover the researchers underline that collaborative concept mapping on the one hand enabled the classroom teacher to follow individually all his/her students' needs and their personal rate of understanding by graphically representing their misconceptions; on the other hand, ICT's and CL helped students to deductively draw theoretical conclusions regarding writing, when asked to concentrate on theory and analyze collaboratively the relevant text. In this way, students are enabled to interact, transfer, and exchange their opinions with the other group members. In relation to this point, some equally interesting research studies verify that ICTs and

specifically the collaborative use of the Concept Mapping Software can greatly improve social communication skills and enhance learning motivation (Guvenc & Acikgoz, 2007; Hwang, Shi & Chu, 2010; Kwon & Cifuentes, 2009).

It is true that the Internet is closely related to the breaking of barriers imposed by natural distances as well as to understanding, accepting diversity and bringing together people of different cultures. Therefore, the Network is of crucial importance especially for children of isolated regions, since, it is through the it, that these children seize the opportunity to cooperate with other children regardless of their physical distance and eventually broaden their spiritual horizons. Scanlon and his colleagues overtly showed in their review that there are computational courses, which afford opportunities for collaborative problem-solving and critical thinking that have beneficial learning outcomes (Scanlon, et al., 2002). Also, teams can work constructively to create posters for various school events or other local topics. Following the pattern of discussion within the group, students determine the context in which they are going to move, record all their ideas, and after all put an effective compilation of them into practice by working on a methodologically designed plan.

Finally, another interesting aspect of ICTs in the field of education concerns the so-called simulation programmes. Simulation systems are based on theories and application which need to be implemented by students so as them to enhance their learning performance by engaging themselves in a real life situation (Zulfiqar, Zhou, Asmi & Yasin, 2018).

To be more specific, with this educational software students can have control over Physical or Mathematical principles and also experiment with scientific processes that would otherwise be prohibited and of course farfetched in real life situations or even very dangerous if they were to be really used within the classroom. It is observed that students present a better academic performance when they collaboratively learn with the aid of simulation systems as compared to non-simulation once (Ke & Carafano, 2016; Otting, Zwaal & Gijselaers, 2009; Zulfiqar et al., 2018).

CONCLUSIONS

Learning is a natural life-long process that calls for incessant adaptation to novel teaching methods. In the light of research findings, already presented, it appears that integrating collaborative learning techniques in academic activities could be beneficial for the students with Special Education Needs as long as they present a pedagogical influence which permeates the teaching process in-depth and yields impressive learning outcomes.

Complementarily, developmental signs of improvement in relation to the social sector take place as pupils learn to accept and appreciate the contribution of the other students to the positive outcome of school work. In addition, they are taught to accept the peculiarities of other students with whom they have to work for a specific common purpose and acquire communicative skills. Finally, the presence of initiatives, challenges and responsibilities, along with the task performances is closely connected with establishing a spirit of social co-responsibility, safeguarding the rights of participation, acceptance and co-responsibility to success (Gillies, 2004).

Moreover, collaborative learning techniques bring Special Education closer to society and to the modern teaching approaches that coexist with contemporary pedagogical research. Indeed, contemporary bibliography includes several papers that clearly refer to the positive results associated with encompassing collaborative learning methods in special education syllabuses towards achieving specific cognitive, social and emotional goals (Keenngwe, Schnellert & Mills, 2012; Walker, Rummel & Koedinger, 2011).

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