Children with Asperger Syndrome and Computer Supported Collaborative Learning activities. A case study in a 3rd Grade mixed class

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Abstract—The core aim of the research presented in the current paper, was to examine the social benefits derived from applying asynchronous discussions in a 3rd Grade class, concerning a pupil with Asperger's Syndrome. Asperger's Syndrome (AS) is characterized by difficulties in communication and social interaction. People with AS rarely face problems in cognitive development but they usually feel loneliness and anxiety because of the social isolation. It is proposed that computer based systems could enhance development of autonomy, encourage communication, boost self-confidence and reinforce optimism and respect for Asperger's Syndrome people. In support of this view, this survey was conducted via observation of a student's, with AS, changes in social interaction and communication abilities. The activity was implemented using the DIAS system, an asynchronous discussion platform with integrated Interaction Analysis tools. The findings show that a remarkable improvement in her social skills occurred. In addition, she could develop conversation skills and engage in a purposeful interaction with others. Finally, the student was overwhelmed by feelings of happiness, although these were temporary.

Keywords: Asperger Syndrome, CSCL, asynchronous discussions; primary education; interaction analysis, critical thinking

I. INTRODUCTION

The past few years Technology Enhanced Learning approaches are often implemented, world wide. These approaches may benefit even people with disabilities or disorders, in multiple ways. According to Walker and Logan [1], digital technology could provide an opportunity for learners to connect, communicate and collaborate. In particular, Dillenbourg argues that virtual learning environments are social spaces through which people interact [2]. Asynchronous discussions are referred to as online interactions among users taking place at different times [3].

The current study investigates the social benefits derived from applying asynchronous discussions in a 3rd Grade class, concerning a pupil with Asperger’s Syndrome. In order to carry out the research, an asynchronous discussion platform named DIAS with integrated Interaction Analysis (IA) related supporting tools (indicators) for the teacher, was used [3].

A. Asperger’s Syndrome

Asperger's Syndrome (AS) is a neurological autism spectrum disorder that is characterized by difficulties in communication and social interaction. It was first identified by Austrian pediatrician Hans Asperger whose name was given to the syndrome. It is supported that AS is a mild form of autism or a “high-functioning” condition of the spectrum [4]. Individuals who suffer from AS find it difficult: a) to communicate with others, b) to express their feelings, c) to regulate social interaction, e) to maintain friendships of peer groups, and f) to cultivate conversation skills [5]. They usually appear to have a deficit in non verbal communication elements, such as tone of voice, facial expression, gesture, gaze and posture [6]. Autism is distinguished from AS since the latter is characterized by lack of clinically significant language and cognitive delay [7]. Most of the people with AS want to be socially active but they do not understand the unwritten social rules [8]. Moreover, people with AS feel loneliness, anxiety, their emotional behavior could easily be changed and many times they are frustrated with no reason [9], [10].

Students with AS rarely face problems in cognitive development, as it seems that they are not confronted with language disabilities but they usually appear to have lack of interest and maybe they excessively focus on a particular topic [4].

Bearing in mind that critical thinking is so much conducive to students’ progress and can lead to enhanced educational discussions, one could argue that critical thinking is cultivated through interactions with others and active dialogue [11]. As aforementioned, individuals with AS have difficulties with their social skills and thus are confronted with problems concerning interaction. However, critical thinking is still important for people with AS. In support of this view, Greenlaw and DeLoach claim that electronic discussions could improve thinking skills because they can combine both writing and in-class discussions [12]. Therefore, people with autism or AS should initially improve their social skills, which in turn upgrades their thinking skills and leads learning progress and to further engagement into peer group interaction.
B. Computer-Mediated Approaches of AS

Parsons et al support that a computer-based task may be the ideal method for social skills training because this specific task could control the level of inputs the user receives, but has more features in common with the real world [13]. The suggested benefits of computer based media for individuals with AS, seem to be the access to a safer role-playing and structured environment and the decreasing anxiety via indirect interactions, as opposed to the real world, where the person cannot reduce the impact of possible social failure [10]. Social interaction in a virtual environment could offer safety to autistic people [14]. Additionally, Charitos et al argue that according to Murray, computer based systems could enhance development of autonomy, encourage communication, boost self-confidence and reinforce optimism and respect [14].

Green argues that conversational skills could be taught via a computer-based environment [15]. In addition, Moore et al suggest that Computer Supported Collaborative Learning could be a suitable environment for teaching communication skills [16]. Finally, Jordan claims that the ability to communicate is a vital life skill [17].

It has been found out by Kalioubi and Robinson, that computer based environments are suitable for use in therapeutic contexts for people with autism, since these environments are predictable and controllable [18]. Also, Weiss and Harris hold the view that scripts generally can facilitate interaction of autistic students with others, which rewards them by being more able to cope with various social skills [19]. Cheng, Kimberly and Orlich created KidTalk, an online environment that runs scripts for interaction, in order to provide treatment in children with AS [10]. Their aim was to explore the social and communicative improvement within the KidTalk environment [10].

Rajendran & Mitchell developed the Bubble Dialogue program in order to investigate the educational value of computer-mediated dialogue for individuals with AS [20]. Although there is no evidence that there was a positive effect in interpersonal understanding, the Bubble Dialogue could help people with AS to regulate interactions, thus to improve their social skills [20].

Furthermore, the positive effects of an interactive microcomputer program named Alpha on students’ reading and communication skills were studied by Heimann et al [21]. In addition, Fun with Feelings is a commercial software that tries to demonstrate emotional skills through sounds or facial expression games. According to Kalioubi and Robinson, it is popular among autistic community [18].

The main benefit of VEs is that users can practice skills safely, without experiencing potentially dangerous real world consequences [13]. Brown et al developed a virtual learning project, the life skills project [22]. It is about a Virtual City for children and adults with learning disabilities. Through this project, children can practise life skills in order to achieve an autonomous and independent living.

Finally, Web 2.0 has been utilized in order to facilitate the social and communicative skills of individuals with Asperger’s Syndrome. For example, Simon Bignell from the University of Derby, has worked intensively with children with Autism and Asperger’s Syndrome. He uses his avatar I Second Life, Milton Broome, in order to improve the communicative and social impairments of such children by putting them in social situations in which they couldn’t respond to in real life [23]. Tartaro and Cassel encourage autistic children to take on virtual “buddies” in online environments, such as Second Life, in order to practice their social skills in a more controlled and safe environment [24]. Finally, John Lester from the Linden Lab, has constructed a private island in Second Life, the Brigadoon [25], on which people with Asperger’s Syndrome or autistic spectrum conditions can socialize with each other and understand their position before moving out into the “wider world” [26].

II. RESEARCH METHODOLOGY

The research presented in this paper, was conducted in a private primary school in Athens, with the participation of 27 3rd Grade students. The designed project was entitled “So…let’s be journalists” and implemented within a special section of the official curriculum, called “Flexible Zone” [27]. This section is suitable for cross-curricular learning activities, which are very flexibly designed and rely on the educator’s initiative. Considering the crucial role of ICTs (Information & Communication Technologies) in education, the core aim of the research was to explore the impact of asynchronous discussions’ usage in students’ writing ability. The duration of the project was six (6) months (October 2009 to March 2010) and was divided in three sections.

In the first section, the researchers attempted to familiarize the students with journalism related concepts, such as journalism, journalists, national news and international news. Additionally, the students were introduced to the meaning of electronic and printed newspaper. Regarding the former, students were asked to bring into the classroom printed newspapers and were assisted in trying to understand how they can be read. Regarding the latter, students were introduced in news related websites and the concept of browsing through them, reading news online.

During the second section of the project, students were assigned the role of a journalist, for 8 weeks. The young learners were writing news, as real journalists, in their textbooks. They were asked to analyze various subjects, such as the environment, swine flu, the weather, sports, etc. These “newspaper articles” were examined by the teacher, who provided feedback to the students.

The last section of the project was implemented via computers. An electronic newspaper was implemented using the DIAS system [3], which integrates Interaction Analysis (IA) related supporting tools (indicators) for the teacher,
facilitating his/her moderating and evaluating tasks. Furthermore, the IA indicators are exploited for facilitating the researcher’s analysis and monitoring tasks [28]. Actually, during the research project, 28 wider news themes were discussed; one assigned to each student and one for the entire classroom. However, all students could comment their classmates’ theme articles, thus implementing an “interactive newspaper”. Students could access the asynchronous discussion forum in the computer laboratory of the school, twice a week. That was the only time they were allowed to write messages or comments in the discussion board, so that the teacher would be able to supervise. The activity was designed so, in order to omit any possible influence of the students’ parents, if they were able to access the discussion forum at home. Overall, the students wrote 426 messages.

The core aim of this research project was to examine if students’ writings are diversified when they use computers and especially asynchronous discussions. Given that one of the participating students had been diagnosed having AS, the researchers decided to study more thoroughly this case, complementarily with the initial research design and aims. For that matter, the student’s social interaction and communication abilities were examined in research for changes in her social relations. This part of the survey was conducted via observation of the student, regarding her real life friendships and the impact they had on her interactivity within the virtual community.

The overall behavior of the student referred to in the current paper was observed throughout the whole school year, regardless of the initial research project implementation. The fact that one of the researchers was the actual class teacher facilitated this research approach.

Initially, a short reference to this student’s social background is necessary in order to be able to fully realize the significance of the research findings. First of all, there was indeed a socializing problem regarding this child. The problem was reinforced by the fact that she was always found alone in the school yard, while all the other children were usually playing as a team. Although she attempted many times to interact and initiate contact with the rest of the students, she was neglected and being different. In other words, this situation. Many times, this child was noticed being melancholic, feeling isolated and had emotional outbursts leading to tears. Admittedly, in this student’s case, lack of friendship was really intense and it clearly indicated fear of becoming neglected and being different. In other words, this could be described as fear of social failure.

The following research questions were formulated for this case:

- Can a student with AS be engaged in a meaningful interaction with other students and cultivate conversation skills?
- If any improvement in social skills occurs, is it permanent or temporary?

III. Research Findings

During the first part of the research project the behavior of the AS-Student was typical, according to the description provided in Section II (Methodology). She has distant from her classmates and isolated socially, throughout the everyday school life. Similar observations were made during the second part of the research project, in which the students wrote their articles in their textbooks. During that time period, the AS-Student did not show any progress in her social skills. Besides, the majority of the students faced these activities, as additional linguistic exercises, having in mind that their textbook is used only for writing exercises. This stage of the research, due to the lack of interaction among students, did not assist the AS-Student to communicate with the rest of her classmates. However, significant improvement was noticed for this student when the third section of the research project took place. As far as the first research question is concerned, it was noticed that overall she was more socially active. She immediately grasped that the learning task involved exchanging messages with each other and developing online communication. She was trying to interact with her classmates and be engaged in a meaningful conversation. Additionally, she fully understood that a message is always read by other online users. Consequently, to her understanding, when someone wanted to initiate a conversation with somebody else or improve his/her friendships, he/she had only to leave a message in this person’s thread. In fact, an indicator showing the total number of messages in every thread, appearing in the initial page of the DIAS system, motivated all the students to increase their participation [28]. Moreover, during the laboratory sessions, each student would state openly and aloud the number of replies they had received, thus pointing out the evolvement of their assigned thread. Referring back to the AS-Student, initially she seemed to have the same feelings of loneliness in the online environment, since she had no replies in her assigned topic. Soon she realized that in order for the communication to take place she had to interact with her classmates. This encouraged her significantly, assisting her in overcoming her initial reservations and be engaged in the project. The Activity
Indicator in Figure 1 is a XY-scattered plot, in which one circle corresponds to every student, participating in the study. The x-axis indicates the number of messages written, whereas the y-axis indicates the number of messages read by every participant. The size of the circle increases proportional to the number of discussion threads initiated by the corresponding user. As shown in Figure 1, the AS-Student was one of the most active students, overall.

The DIAS system produces several indicators, depicting the exact behavior of each participant in a collaborative, discourse learning activity. For example, the diagram in Figure 2 shows that the AS-Student participated in 8 discussion topics. Topic No 21 is her assigned topic, thus her participation is higher in that one. Most of the messages she wrote (62% - 13 out of 21) are spread in 25% of the open discussion topics (7 out of 28), indicating her will to interact with her classmates, by commenting on their assigned topics. So far, the participation of the AS-Student looks adequate. In fact she has one of the biggest participation ratios, as seen in Figure 3. The diagram in Figure 3 depicts the participation ratio in matters of writing messages, comparing all the participants with each other and the average participation ratio as well (red line). This is remarkable without any further examination, considering her situation.
Further examining the interaction of AS-Student with her classmates, it is obvious that it was adequate, even for a student with no such problems. The two SNA diagrams in Figure 4 confirm that. In the SNA Answers Indicator in Figure 4a, the vortices correspond to students and the connecting arrows correspond to answering messages. An arrow from Student A towards Student B indicates that Student A has posted at least one answer to a message written by Student B. Likewise, in the SNA Reads Indicator shown in Figure 4b, the arrow indicates that Student A has read messages written by Student B. The position of the AS-Student in both SNA diagrams and the connections with her classmates prove that she highly interacted with them.
Finally, examining the SNA Answers Indicator for her assigned topic (Figure 5), it is evident that several of her classmates were interested in the content of that topic.

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During the computer laboratory sessions, the students often occupied the computers in pairs. They either waited for each other, taking turns in using the computer for about 20 minutes each, or went through new forum messages together, thus gaining time in order to better think, individually, what they were going to write in the discussion forum and where. An observation was made that when the AS-Student was seated in front of a computer on her own, she could correspond better to the act of communication, through the electronic means. When she was sharing a computer with a fellow student, she faced a great difficulty in expressing herself in written form. In the presence of somebody else she could not even take the initiative to start typing. Nevertheless, when she occupied a computer on her own, she responded in a very positive manner towards the whole activity. It seemed that she was overwhelmed by another student’s presence, thus failing to correspond to the communication task. Nevertheless, the “isolation” provided when she used the computer alone, made her feel safe and confident enough to interact with her classmates, through the discussion forum.

Regarding the second research question, the observation showed that after the computer laboratory sessions, the AS-Student was overwhelmed with feelings of happiness. She was socially more active in real life, not only when the lesson took place, but also during the breaks. The explanation for the sense of satisfaction by her seemed to be the online communication and interaction between her and her classmates. What the teacher noticed and is worth mentioning was that the AS-Student was more social during the break period, right
after the computer laboratory session. She was trying to approach the students with whom she had already developed an online conversation regarding the task they had been involved in. In this way, she came close to them and this made her feel a member of the team. During those times, she had no emotional outburst, leading to tears, which is a typical symptom of AS, as aforementioned. This positive behavior though, usually lasted only for the duration of the corresponding break period, to be repeated after the next laboratory session. Thus it was completely temporary. During the following break periods, she returned to her previous behavior, as if no changes had been made at all to her antisocial behavior.

Although an improvement regarding the AS-Student’s social skills was noticed, it was only temporary and quite short in duration. It is evident that in order to extract wholesome conclusions, more extensive research is necessary, covering a bigger time period. It is necessary to conduct at least a whole year research, especially for this student, in order to extract concrete conclusions regarding her social skills’ evolvement; can the positive effects of the electronic medium last longer, reaching a point in which they could be permanent?

IV. DISCUSSION

This study aims at examining the social benefits derived from applying asynchronous discussions in a 3rd Grade class, concerning a student with Asperger’s Syndrome. It is proposed that digital technology could provide an opportunity for learners to connect, communicate and collaborate [1]. Additionally, a computer-based program could offer safety and encourage communication to autistic people [14]. The core aim of this research initial design was to explore the impact of asynchronous discussions’ usage in students’ writings. The findings of the basic research indicate that asynchronous discussions could be successfully integrated in primary schools in order to promote active learning and enhance students’ performance [29]. The study, described in the current paper, indicates that asynchronous discussions could enhance communication and conversations skills in students with Asperger’s Syndrome. With reference to the findings of the research, the latter support this view. The indicators produced by the DIAS system show the AS-Student’s attempt to communicate with her classmates and participate in a purposeful discussion. Her messages were spread in 25% of the open discussion topics (7 out of 28). Furthermore, she engaged in a meaningful interaction with her classmates and she was one of the most active students (Figure 1). In addition, she presented a temporary improvement in her real life social activity. Her social skills’ improvement seems to be explained by the fact that while she was always seeking communication and interaction with the others, she did not know how to come in contact with them. The asynchronous discussions gave her the opportunity to interact, publish her thoughts and cultivate conversation skills. The fact that she could not be integrated into the project when she was sharing a computer but at the same time she responded freely and actively when she occupied a computer on her own, indicates that although in the real life she is used in loneliness and isolation, actually when she had the opportunity to communicate in her own rules, she could cultivate her social skills.

Taking into account the significant, although temporary, improvement of AS-Student’s social skills, but also the initial design of the research project, it is necessary to carry out more extensive research in order to extract wholesome conclusions of the computer’s impact on autistic society. Computer mediated collaborative activities, other than asynchronous discussions, could be utilized for that matter. It would be interesting to see how individuals with AS respond to the “pressure” of synchronous collaboration, such as chat sessions. Even more tangible collaborative activities, involving artifacts’ manipulation in parallel to computer mediated communication, could be used as means of interaction among normal students and ones with AS. Finally, scripted collaborative scenarios, even within dialogic activities in discussion fora, with concrete targets for the involved groups consist an interesting research approach.

REFERENCES


