

METACOGNITION IN THE E-LEARNING ENVIRONMENT: A SUCCESSFUL PROPOSITION FOR INCLUSIVE EDUCATION

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The Locus of Control is a specific mode that allows each individual to identify the causes that determine a given event and therefore their own successes and failures. The internal attribution style is based on the subject's ability, commitment, and intelligence. It strengthens self-esteem and sense of personal self-efficacy and is crucial to fostering school success. This research shows that an attributive-metacognitive training can improve the attributional style of students with Special Educational Needs (SEN). Such training offers the students the opportunity to reflect on their skills and strategies by expanding motivation through Information and Communication Technologies (ICT). This perspective and longitudinal study, measured the attribution style of attendees (30 subjects attending the first grade of secondary school in northeast Italy) before and after a metacognitive and attributive program. The training, carried out on-line and in attendance, lasted FOR about 8 months (from April 2015 to November 2015). The article

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presents the positive outcomes of the training, obtained by comparing the data emerging from the Attribution Questionnaire and regularized and standardized values (De Beni & Moè, 1995). The study extends knowledge on approaches and programs aimed at improving the attributional style in children with SEN. A progress of the internal attributional style is conducive to improving academic success in these subjects.

1 Introduction

Within the Italian framework on school inclusion, the entry into effect of the Ministerial Directive of 27 December 2012, introduced the concept of “Special Educational Needs” (SEN). The term refers to a very wide area of disadvantage, much broader than the one explicitly referred to in the case of a deficit. Pupils with Special Educational Needs experience a particular organic, biological or otherwise family, social, environmental or contextual related situation that hinders them in development and learning: the difficulties can be global and pervasive or more specific, serious or light, permanent or transitory. To the usual educational needs that all pupils have (need to develop skills, need for belonging, identity, valorisation, acceptance...) something different, “special” is added; to work best with these pupils, therefore, we will need “special” and more effective skills and resources (Ianes & Cramerotti, 2005). During their school career, in most cases pupils with SEN develop a low self-esteem, poor perception of self-efficacy and feelings of depression, in addition to presenting particular issues caused by difficulties of attention, poor motivation and inadequate strategic and organizational skills. The school environment is trying to give concrete answers to the individual needs of these students, with the goal of creating personalized learning paths and providing students with ad hoc tools to learn better.

De Beni e Moe’s (1996) studies have found that metacognitive interventions focused on strategies allow to improve the relationship of subjects with the study process, as it recognizes the value of engagement especially in case of failure. Strengthening commitment to engagement and skill is crucial to forming subjects that, effectively utilizing the most appropriate meta-cognitive strategies, successfully deal with school assignments.

Considering also that children are familiar with electronic devices, they know the dynamics of electronic interaction and are highly motivated by the use of ICT), the possibilities offered by technological innovation are fully integrated into the process of building an inclusive, personalized education. Technologies facilitate a multichannel approach serving the different learning styles, allowing active engagement and high attention from students, spontaneously triggering cooperative dynamics and allowing transferability of content and school/home materials. In particular, distance learning via learning

platforms promotes a collaborative, reflective and metacognitive approach to study, as well as allowing the building of learning communities and co-building knowledge (Cacciamani & Giannadrea, 2004; Scardamalia & Bereiter, 2004; Sthal *et al.*, 2006; Trentin, 2001; Varisco, 2008; De Marco & Albanese, 2009; Berizzi, 2016).

Indeed, e-learning produces substantial enrichment in communication, organized in pair and group mode, and in educational co-operation, which is also managed at a distance. ICT tools such as e-mail, Skype network conversations, videoconferencing, e-learning platforms (such as Moodle, Edmodo, and others) have a unifying power because they reduce space-time barriers, allow to create a support network and to enjoy independently and at any time the materials (cards, slides, questionnaires, videos, etc.) made available on the online platform. Participation in remote activities, such as on-line forum discussions, based on the principles of collaborative learning, implies a certain autonomy from the students. Such autonomy, is strengthened by continuous confrontation and support of Tutors and peers, and reflection on what has been done, the goals to be achieved, and ultimately the strategies to be adopted. Thus, the ability to self-regulate the study process is stimulated and participation in collaborative activities is stressed and supported (Lynch & Dembo, 2004, Nevgi *et al.*, 2006, De Marco & Albanese, 2009).

2 State of the art

During the school year 2014/15, within the project “Listening to each other to Listen” (Special Tender for the Friuli Venezia Giulia Region, Italy and the Inclusion Network of the Comprehensive School Institute of the Province of Trieste), the activation of a metacognitive e-learning training platform was decided for first-grade secondary school children, belonging to three Comprehensive Schools in Trieste. The experience was addressed to SEN boys with specific diagnosis of SLD and ADHD. SLD refers to Specific Learning Disorders (315 in DSM-5, APA 2013; F81 in ICD-10, 1992) the most commonly OF WHICH are dyslexia, dysgraphia, spelling disorder, and dyscalculia. ADHD, acronym for Attention Deficit Hyperactivity Disorder, refers to the evolutionary disturbance of self-control characterized by lack of attention, impulsivity and motor hyperactivity (314 in DSM-5, 2013; F90 in ICD-10, 1992). The SEN youth training was borrowed from the successful research conducted in the school year 2013/2014 with a group of oncological males at risk of school failure due to disease problems and with a double incidence compared to healthy peers (Shiu, 2001). To help these students succeed in academic achievement, they were offered an attribute training on a Moodle platform that led to a significant enhancement of attribution and changed the attributive style of these oncologic

subjects from external to internal (pre-post internal comparison: Internal_pre 19.69 vs interna_post 26.54: Wilcoxon test: $p = 0.0000$). In light of the positive experience with the boys in the hospital, the project and the training were transferred to the school. The aim of the school institutions involved in the project was to offer SEN students an opportunity to face more serenely their school career by offering them methodological and didactic approaches to address and overcome difficult conditions. The training offered within a Moodle platform (online computing environment, which involves the creation of virtual classes that enable effective and motivating network learning experiences) is therefore an added value to the metacognitive course, enabling students to identify and develop their potential and capabilities at best, through an innovative and motivating approach. In addition, the on-line platform stimulates students at home, increases their interest and gives them an opportunity to practice independently for self-sufficient control in execution.

3 Methodology

Subjects: 30 children with special educational needs (SEN) attending 1st grade secondary school of three school institutes in Trieste were recruited. The subjects of the clinical group who participated and completed the entire metacognitive training course as well as the test/retest phases were 21 (M 66.7%, F 33.3%). They are between the ages of 11 and 15 (average age = 12.4) and have already received a specific diagnosis (DSA 80%, ADHD 20%). Participants' families were given an information letter explaining the project objectives, the steps and the tools used. After obtaining informed consent from parents, the assignment questionnaire (De Beni & Moè, 1995) was given to students for the first time (April 2015). At this point, the first stage (reception) of the attributional training started, as described in Table 1. At the end of the training (end of November 2015), which was done in blended form (partly in presence - eight meetings - and partly on-line), the questionnaire for the 21 subjects who completed all the stages of the program was re-administered (retest). At the end of the training, each participant and their respective parents were asked to fill in a feedback questionnaire in order to gauge interest, satisfaction and usefulness of the training.

Table 1
OVERVIEW OF THE ATTRIBUTIVE AND METACOGNITIVE PROGRAMME

Main aim
Enhance children with Special Educational Needs to a positive self-attribution. The positive self-attribution facilitates a better quality of life and success in the field of education.

Objectives
Develop motivation, interest, willingness, self-esteem and in the children who enrolled the training, in order to strengthen their self-esteem and their self-efficacy.
Materials
<p>The resources and activities enabled on the platform were: slides (to present the topics of the modules activated), questionnaires (to help the students to reflect on motivation, method and study skills, learning styles, self-control of anxiety, attribution), cards (to reinforce what they have learned and to practice, using new strategies, how to learn effectively), a glossary (where to insert new terms), a forum (with news, welcome discussions on various topics), doors (to send individual homework).</p> <p>The materials (slides, forms, questionnaires, quizzes ...) were designed by the AUTHORS or have been selected from the successive programs: "Imparare a studiare 2" (C. Cornoldi, R. De Beni & Gruppo MT), "Empowerment cognitivo e prevenzione all'insuccesso" (F. Pazzaglia, A. Moè, G. Friso & R. Rizzato), "Percorsi verso il SUCCESSO" (P.R. Ferrari, M. Vassallo e M.A. Zanetti), AMOS, AMOS 8-15 (Cornoldi, De Beni, Moè, Zamperlin & Meneghetti). The materials were adapted to the specific context of the study and to the e-learning modality.</p>
Course structure
<p>There were three phases in the e-learning training program (reception, exploratory phase and reinforcement phase) and these ones were divided in modules. Each participant was given the opportunity to discuss individually the topics debated on the platform.</p> <ul style="list-style-type: none"> • Phase 1 <p>April 2015: initial evaluation of the metacognitive and attributive style of the participants (2 hours).</p> <p>The first phase of reception intended to put each participant of the new learning environment in a state of psychosocial well-being in which they can better understand their needs and their potentiality, start relationships, find the motivation to take up a training path.</p> <ul style="list-style-type: none"> • Phase 2 <p>The second phase of exploration intended to make each participant aware of their limitations and of their potentiality in order to promote the investment of resources on those topics that require more intervention and also to reinforce skills that the students already had, so to strengthen their self-esteem and their self-efficacy. In this second phase issues such as motivation (module 1), method and study skills (module 2), learning style (module 3), anxiety and stress for examination (module 4), attribution and perception of the self (module 5), were discussed.</p> <ul style="list-style-type: none"> • Phase 3 <p>In the third and last phase of reinforcement the efficacy of the method of study was strengthened. Various activities were suggested: detailed reading of slides, forms to complete, discussion forum where to ask questions in order to develop learning strategies that will help the student to memorize a text, make connections and comparisons between items of knowledge, learning to summarize, schematize with concept maps, understand how to take notes, learn techniques to follow the lessons, improve the organization of time, strengthen the motivation, focus on the commitment.</p> <p>Operationally, the participants in the platform had the opportunity to:</p> <ul style="list-style-type: none"> • access materials to examine in depth the topics; • fill in questionnaires the tutor created for the students; they would then sent them back, completed on-line to the tutor; • complete operating cards that were delivered to the tutor, through a door "delivery tasks"; • access a forum where the participants opened discussion threads for dialogue and reflection together on the debated issues. <p>November 2015: final re-evaluation of the metacognitive and attributive style of the participants (2 hours).</p>
Evaluation tools
No evaluation was planned, but frequent feedback was offered on the activities performed by each participant, in order to stimulate commitment and motivation.

4 Results and discussion

The Attribution Questionnaire (*Ibidem*) was proposed in the first phase of research (April 2015) to all subjects in the clinical group and subsequently represented to them (November 2015) at the end of the metacognitive training to verify the changes that have occurred in relation to attribution styles. The scores obtained in the 10 success/failures rates scales (SC, FC success/failure commitment; SS, FS success/failure skills; ST, FT success/failure task; SH, FH success/failure help; SL, FL success/failure luck) by each child were compared to the normality limits for their level of schooling (the normality limit is given by the mean \pm standard deviation, ascribed to the average Italian reference sample of 1280 students as indicated by the standardized and validated instrument used). The following are the averages that the clinical group has expressed in each of the 10 attribution scales. The averages obtained in the first test phase were then compared with the averages that emerged in the retest phase.

The data collected in the first phase of the test show a clinical group that presents overall average values, but with very high indices and very close to the high reference values of normality for success rates/failure connected to luck (SL, FL) and help (SH, FH). This indicates that in the first test analysis the attributional system of these children is within the norm but more projected towards external attributes.

Table 2
 AVERAGE SUCCESS/FAILURE RATE DUE TO LUCK AND HELP OF THE CLINICAL GROUP WITH REFERENCE TO THE MINIMUM AND MAXIMUM NORMALITY LIMITS OF THE STANDARD ITALIAN SAMPLE.

Average Success/Luck			Average Failure/Luck			Average Success/Help			Average Failure/Help		
Clin. Gr.	SL ref-	FL ref+	Clin. Gr.	FL ref-	UF ref+	Clin. Gr.	SH ref-	SH ref+	Clin. Gr.	FH ref-	FH ref+
10.71	3.00	13.52	9.05	3.00	12.52	8.24	2.52	12.00	6.57	1.48	10.52

The data emerged in the retest show a clinical group that presents overall values within normal limits, but with very high indices and very close to the high reference values of normality for success rates/failure connected to commitment (SC, FC) and skill (SS, FS). In the retest, therefore, an attribute profile of the clinical group more fully oriented towards internal attributes emerges.

Table 3
AVERAGE SUCCESS/FAILURE RATE SCALE DUE TO COMMITMENT AND SKILLS OF THE CLINICAL GROUP WITH REFERENCE TO THE MINIMUM AND MAXIMUM NORMALITY LIMITS OF THE STANDARD ITALIAN SAMPLE.

Average Success/Commitment			Average Failure / Commitment			Average Success/Ability			Average Failure /Ability		
Clin. Gr.	SC rif-	SC rif +	Clin. Gr.	FC rif-	FC rif +	Clin. Gr.	SS rif-	SS rif +	Clin. Gr.	FS rif-	FS rif +
28.05	20.38	31.37	28.43	18.14	29.33	19.90	8.48	21.76	15.95	7.05	18.71

In detail, the comparison between the averages of the values expressed by the children in the test/retest, i.e. before/after training, offers promising results. It should first be noted that all values expressed in the 5 successive scales and in the 5 scales related to the failure have undergone modifications. Specifically, the averages referring to internal attributes show implementation of values regarding the commitment and skill scales (SC, IC, SS). This is particularly relevant because commitment, which is “an internal, unstable and controllable attribution, is the most important attribution type to be considered “first” to interpret the score and delineate the attribute profiles (De Beni & Moé, 1995, p. 26).

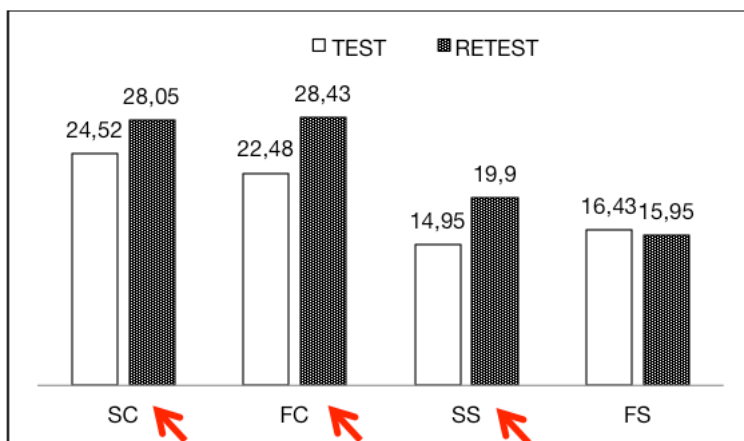


Fig. 1 - Internal attribution (commitment, skills) of the clinical group in the pre-post training comparison

Conversely, the averages related to external attribution, or causes of success/failure attributed to task, help, or luck, indicate a decrease in values expressed in all scales of the retest (ST, FT, SH, FH, SL, FL), thus showing a reduction

of the external attributional locus.

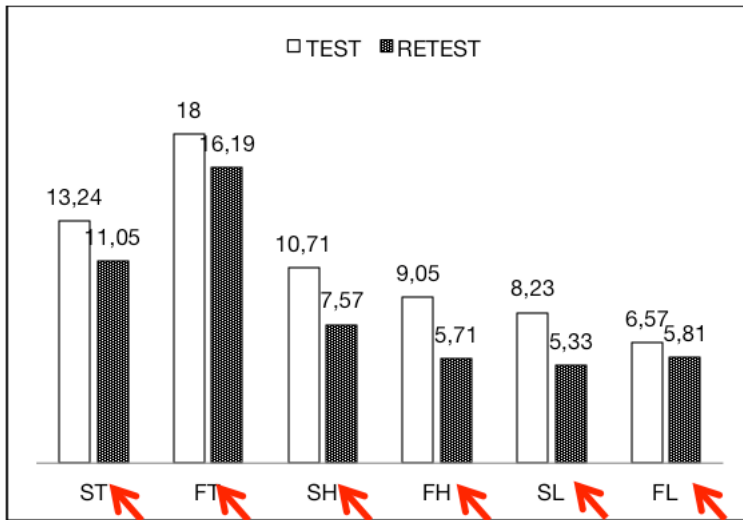


Fig.2 - External attribution (task, help, luck) in test/retest comparison

In summary, the comparison between the averages expressed in the first test phase and the averages shown by the retest indicate a modification of the attribution style of the subjects. This means that the proposed training was effective in changing the profile of attributive styles of the clinical sample. Subjects who have benefited from the training have decreased scores in external attribution and increased scores in internal attribution, especially those related to engagement, steadily orienting their profile towards GSU: good strategy user (Borkowski & Muthukrishna, 1994). This is particularly relevant in this study with children with SEN, as “particular categories of subjects, such as hyperactive children or learning disabilities, do not understand the relationship between commitment, strategic behaviour and effective performance, relationship that must be taught to them.” (Borkowski *et al.*, 1986).

To complete the positive scientific outcomes shown by THE data analysis, it is interesting to provide some qualitative evidence emerging from the questionnaires offered to the children (100% of responses) and parents (57%) at the end of the proposed training course. As regards the interest in the course, positive feedback was given by both children (quite a lot 32%, a lot 48%, very much 20%) and parents (quite a lot 50%, a lot 33.3%, very much 16.7%). With regard to the metacognitive teaching that leads the student to reflect on his/her own abilities, his/her method of study, the strategies used, the parents expressed themselves positively (quite a lot 25%, a lot 58.3%, very much 16.7

%). And their responses have been even more impressive to the question “Do you feel that learning to study is important?”, as the answers focused on a lot, 25% and a very much, 75%. The children who were asked if the training carried out has allowed their attributional style to be improved, so as to always aim on commitment to succeed in school activities in the future, responded with a 44% quite a lot, 40% a lot and 16% very much. The same question submitted to parents has provided the following evidence: 33% quite a lot, 58.3% a lot and 8.3% very much. The children and parents questioned about the possibility of recommending the course to other students, responded in both cases with 100% yes.

Conclusions

In the complex SEN universe, intervention modes, approaches, methodologies, contexts and lines of action are very diverse: vision, however, must be systemic and must take into account the totality and complexity of the interconnected variables which manifest themselves. The heterogeneity of the students, characterized by diverse diagnostic situations, diversity and originality from the point of view of styles and learning strategies, emotional-affective needs, relational attitudes, and specific family and environmental situations, is now closely linked to an increasingly open school environment for exchange and participation. Metacognitive intervention and ICT can contribute effectively to the definition of learning paths that meet student needs (Berizzi, 2016) and provide more opportunities to discover special skills and talents (Veronico, 2014).

The results of the research, albeit limited to a limited sample, offer positive results on the success of an attributional-metacognitive training in e-learning in favour of children with special educational needs. The attributional style of the children has shifted from an external orientation to an inner locus, implementing the role of commitment as the main vector in defining their own successes/failures and in enhancing the active role of the subject that has the ability to control success and failure. The proposed intervention owes its success to the merging of two fundamental elements, the metacognitive approach (Borkowski & Muthukrishna, 1994; 2011) - attributional (De Beni & Moè, *op.cit.*) and the methodology used through ICT (Cacciamani & Giannadrea, 2004; Scardamalia & Bereiter, 2004; Sthal *et al.*, 2006; Trentin, 2001; Varisco, 2008).

The evidence emerged from the qualitative survey demonstrated the favourable acceptance of the training by both the children and the reference adults involved. They were both, convinced that an enhancement of the attributional style can produce positive impacts on academic success. The path to be undertaken or to be carried forth must be based on the notion that traditional didactics may be good for everyone but not for children with SEN, while a SEN didactics

could be good for everyone and must be seriously considered as a training for all the students in the classrooms which include children with SEN, modifying learning environments and integrating information and communication technology (ICT) in education, particularly e-learning.

The current Research has shown that attributional-metacognitive training jointly with ICT is a frontier that deserves further insights. It is desirable to be able to conduct studies with larger clinical groups in the future and to carry out follow-up analysis of the interventions already carried out. In the future, further research that includes training specifically targeted at homogeneous groups according to disorder (DSA only or ADHD only) will need to be done to verify whether the metacognitive-attributional training in the e-learning environment, as it is structured now, provides different benefits or needs more targeted differentiation according to subjects.

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