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Institutional Projects of Diversity Attention *versus* Regular Didactic Methodology Adapted to Students with Autism Spectrum Disorder

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SUMMARY: The teaching and learning of students with Autism Spectrum Disorder (ASD) requires the design of diversity projects at the different institutional levels of the educational centre. However, if these projects are not well adapted to the specific needs of the students, they will not achieve the expected effective results. In a study conducted with a total of 145 participants from different schools, it was shown that the presence of specific institutional educational projects was not a sufficient condition to respond effectively to the needs of the participants, whose curricular and social improvements were not shown to be significant (sig: .66). Even in the absence of these high-scale projects, when the usual methodology was well adapted to the specific needs of students with ASD, the improvements found in the academic and social, that´s coded as dependent variable (DV): improving, domains were highly significant (sig: .00) in terms of the use of meaningful didactics based on the creation of networks of relationships between informative content or highly meaningful learning. Now, the interactive *constant* of both components, i.e. the intersection of a project design when these have been appropriately adapted to the particular needs, then both variables became the explanatory variance of the academic and social of DV of students with ASD (*constant t* for the sum of nodal relationships + project: 3.70 (sig: .00), to which was added the explanatory variance of the students' age intervals (*constant t* for the sum of nodal relationships + project + age: 4.07, sig: .00): 3.70 (sig: .00), to which was also added the explanatory variance of the students´age intervals (*constant t* for the sum of nodal relationships + project + age: 4.07, sig: .00). 70 (sig: .00), to which the explanatory variance of the students´ age intervals were also added (*constant t* for the sum of nodes + project + age: 4.07, sig: .00). In conclusion, the design of general institutional projects, even if they cover all levels of education, are not effective on their own unless they are specifically tailored to the particular needs of the target student's variable: "improving".

KEYWORDS: Autism spectrum disorder. Significant learning. Educational projects. Adapted regular teaching.

INTRODUCTION

From a conceptual perspective, the Autism Spectrum Disorder (ASD) (American Psychiatric Association (APA), 2013), constitutes a neurodevelopmental disorder, the prevalence rate of which, according to extensive statistical analyses, has been reported by McFarland et al. (2019) y Maenner, Shaw & Baio (2020), is approximately 1/54 children born. The disorder is characterized by a neurological perceptual-cognitive processing, which is based on a cyclical propositional process, the theoretical hypothesis of which has been put forward by Ojea (2023), which partially corroborates earlier perceptual theories (Caron, Mottron, Berthiaume & Dawson, 2006; Frith, 1989; 2004, Happé, 1999; Happé & Frith, 2006); however, the new cyclical theory presents some very significant specific peculiarities. Firstly, the perceptual analysis level between the ASD group and the neurotypical group shows some global-semantic content, although a weaker semantic level has been found in the ASD group, which they compensate for in a second analysis of the stimulus.

Thus, psychoneurological processing as a whole along the sensory- perceptual- cognitive process is systematically focused on the interaction of neural networks. Deficits in the development of neural relations are related to the flexibility in the transition of information, so that there are important nodal limitations in relating new information from the outside to the content previously stored in permanent memory, which affects the set of basic human psychological processes. But, besides, the perceptual inputs or conceptual units must be conceptually categorized in broad hierarchies that facilitate the working memory

to carry out the process of accessing such information in the permanent memory, which is also deficient due to the limitations for the development of significant nodal relationships between the informative contents. In this sense, the propositional hypothesis of autism is maintained on the basis of the relational limitations between the perceived new stimuli, as well as between the previously stored information, if it doesn´t count in an effective way with the meaningful attributions carried out during the learning process.

For this reason, the understanding of the functioning of people with ASD has to rely on executive processing and mediated regulation processes between information contents, with the aim of progressively fostering self- regulation of the nodal creation between these contents, in order to facilitate increasingly active learning, which, in wheel, will enable the subsequent retrieval of information when necessary.

Hence, this executive process is not only related to academic curricular development, but also, above all, to the tasks of regulation and self- regulation of thought, social behaviour and, especially, to motivational processes, which will constitute the basic pillar of active participation in learning (Boekaerts y Cascallar, 2006; Dembo & Eaton, 2000; Hattie & Timperley, 2007; Vaughn, Wanzek & Murray, 2012).

That´s a fundamental task that learning and development of people with ASD be complemented with highly meaningful associations that facilitate the relationships between the proposed psycho-socio-educational objectives, otherwise, learning will have an excessively mechanical component that will impede the development of higher order executive processes, such as problem solving and the execution of deductive and synthetic elements. Therefore, it is necessary to promote a complementary associated learning to facilitate the creation of nodes that are not automatically generated in people with ASD, whose ultimate purpose is the hierarchisation of categories in the semantic memory with significant related links or key elements of access to long- term memory, which, in turn, will get for the subsequent recovery of information (Aracı, Melekoğlu & Çetin, 2023; Baddeley, 1999; Dunn & Miller, 2016; Gore, 2010; Selçuk, 2018). When this is done, it is possible to facilitate the higher- order executive elements, within which, as said Cioca & Nerisanu (2020), personal creativity is the main element of cognitive processing, as has been demonstrated in studies based on mnemonic memory and information remember strategies (Boon Urton, Grünke & Rux, 2019; Lubin & Polloway, 2016).

The process of relational development involves a highly structured and very well tiered system of mediation, in which the basis of the new concept must be highly proximate to the previously codified concept, which implies an earlier process of conceptual categorization. In this sense, the State Education Agencies (SEA) and the Local Education Agencies (LEA) use the terminology "MTSS" regarding this highly meaningful, stepwise system of content integration specific support (Zhang, Martella, Kang & Yenioglu, (2023), in order to complement the specific learning process, according to the particular needs of each student, based on the student´s strengths of support to progressively continue the support mediated process, both curricular, psycho-socio-emotional and behavioural, as has been empirically shown in the Center on Multi-Tiered Systems of Support (2022).

Hence, the descriptors- mediators of the teaching-learning process must include a relationship of individual learning with all the interrelated factors at the social level which, as indicated by the Council of Europe (2018), regarding language learning, it should must include the continuous interrelation of all the intervening factors in the mediated learning process, whose end aim is to facilitate the efficiency and effectiveness about, which is related to what Cook & Cook (2013) and Reichow & Volkmar (2011) have been called Evidence Based Practices (EBP). Indeed, EBPs have been shown to be highly effective in the area of meaningful associated learning in the ambit of mediated intervention for people with ASD (Cook & Odom, 2013; Cook, Cook & Collins, 2016; Mursi & Sulaimani, 2022; Ziviani et al., 2015), which, as Spencer et al. (2012) through the National Autism Center, have shown, it relate the theoretical process with its practical functional content, facilitating interrelated intervention in an active way, with the aim of creating highly significant learning, both in the curricular field and in the psycho-social area.

In this sense, Morin, Sam, Tomaszewski, Waters & Odom (2021) affirm to the empirical development of different projects have been built on the basis of a meaningful-functional orientation of learning for students with autism, which have given rise to different types of educational practices that foster a theoretical-practical relationship that serves, in turn, as a meaningful component of the related educational process, which are complemented by current relevant specific technological advances (Odom, Collet-Klinenberg, Rogers & Hatton, 2010; Wong et al., 2015), to enable professionals to implement meaningful teaching methods adapted to the specific needs of each country (Larkan-Skinner & Shedd, 2021; Liu et al., 2018; Mandinach, 2012; Yamamoto & Alverson, 2023).

All these studies lead to the conclusion that it is necessary for schools and institutions to have specific support plans that are properly structured to meet the specific educational support needs of people with ASD. In this sense, attempts have been made

to develop comprehensive responses focused on these needs, such as the development of the CSESA Project (Comprehensive Programme with Focus on Specific Learning Needs) adapted for students with autism in secondary schools, with the aim of improving the curricular-academic development of students with autism (Carter et al., 2014; Fleury et al., 2014; Hume et al., 2014; Test, Smith & Carter, 2014). This project is based on the use of a wide range of methods of interrelated support, both between the children themselves, through cooperative learning, and within teachers, supported by specific training programmes, and ultimately enclosing all the social factors involved in the educational process, including families and social services. For this reason (Frost et al., 2020), the interactive aid programme HIIYH, which includes the programme´s core support components ESDM, implies of learning based on five main components: 1) real-time information for teachers, 2) continuous training for teachers according to the needs generated in real time, 3) training for families at the same time as for teachers and according to the same parameters, 4) processes of independent learning for families through the HIIYH, through the use of videos and other interactive didactic materials, and 5) the student- led learning process based on the interaction between teachers and families, in accordance with the basic training hypotheses and according to each specific need. This project has been designed on the basis of four clearly differentiated modules: 1) enhancement of attention-perceptual development, 2) development of social-communicative processes, 3) repetition of the development of learning through systematic routine through shared relational activities, and 4) the A-B-C behavioural improvement system (antecedents - consequents - outcomes).

However, if these or other specific interactive and interrelated projects are supported in the development of meaningful relationships in the learning process, their effectiveness will have a very relative impact on the expected results. Thus, despite the existence of specific support processes elaborated in schools by specialised teaching staff and specific didactic methodologies of complementary support, in terms of pedagogical reinforcement or curricular adaptation, the results may not be fully satisfactory if the basis is not supported by a theoretical foundation of the creation of meaningful relational networks between curricular and social contents, in which people with ASD are very deficient.

Therefore, the main aims of this research have been: 1) to analyse whether support based on the provision of specialist teaching staff is necessary to facilitate the successful psychosocial and educational development of students with ASD, 2) to identify the need for methodological and didactic measures tailored to the specific needs of students with ASD, and 3) to analyse the importance of developing relationships or relational nodes during the process of academic and social development of students with ASD. Furthermore, the study attempts to identify the hierarchy of such measures when they are partially applied during the curricular and/or social development of the targeted students with ASD.

METHOD

Research design

The research design is based on the application of an ad hoc questionnaire applied to different schools in Spain where students with ASD attend school, with different levels of ASD and different age groups, making a total of 145 students with ASD who participated in the study.

Variables and codes

The variables coded for the study and their corresponding codes are as follows:

1. The currently existing levels of ASD (APA, 2013, op cit.), whose code is “level”.
2. The age intervals of the study participants: “age”, which corresponds to four age intervals: 3-6 years, 6.1-9 years, 9.1-12 years, and 15.1-18 years.
3. The type of support, referring both to specialized human factors, to the adapted methodologies applied, such as educational reinforcement or curricular adaptation, and to the adaptation of special temporary environments for the implementation of support or its realization within the regular classroom, whose code is “support”.
4. The design of a specific methodology based on the creation of neural networks between the informative contents merged within the regular didactic environment or with the previous support indicated in point 3, coded as “nodes”.
5. The improvement in the overall development, both educational and psycho-social in the students from the perspective of the professionals who have answered the questionnaire, coded as “improving”.

Procedure

Once the ad hoc questionnaire was developed, it was sent to different schools with students with ASD. The variable “support” consisted of the calculation of different questions related to the support procedure that was carried out in the educational center: provision of specialist teachers, special methodological adaptations, training processes, interactions between teachers

and/or families and associations/ specific intervention centers. Once this variable had been calculated, the subsequent statistical analysis was carried out.

Data analysis

Results analysis have been found throughout a statistical procedure treated with the SPSS programme, considering the variable "improving" as DV, while all the other variables of the study as factorial components that, in terms of variability, influence their variance on this DV.

RESULTS

Participants

A total N: 145 students with ASD have been participated in this study, of which its distribution according to ASD level and age intervals, it has been analyzed by statistical contingency test is shown in Table 1.

Table 1: level * age Crosstabulation.

		age					Total
		3-6 y-o	6.1-9 y-o	9.1-12 y-o	12.1-15 y-o	15.1-18 y-o	3-6 yo
level	level-1	31	35	10	26	4	106
	level-2	14	5	2	2	0	23
	level-3	4	7	1	3	1	16
Total		49	47	13	31	5	145

In synthesis, a total of 145 participants with ASD have participated in this study, 106 correspond to level 1, 23 to level 2 and 16 to level 3. 49 students correspond to the 3-6 y-o interval, 47 to the 6.1-9 y-o interval, 13 to the 9.1-12 y-o group, 31 to the 12.1-15 y-o group and finally 5 to the 15.1-18 y-o interval.

General descriptive

As a first preliminary observation, the most important general statistics for the dynamic variables of the study are presented, referring to the minimum (min.), maximum (max.) values, the statistical mean found (μ), the total sum (Σ), the standard deviation of the different scores for each variable (σ) and the explanatory variance of each one (σ^2), which can be observed in Table 2.

Table 2: General Statistics (N: 145).

	Min.	Max.	μ	Σ	σ	σ^2
support	.00	5.00	2.46	358.00	1.47	2.18
nodes	.00	5.00	3.57	518.00	1.43	2.06
improving	.00	5.00	3.68	534.00	1.44	2.07

Initially, it is important to highlight that the sum and mean scores are not equal for the following variables "support" and "nodes", there being significant differences, both for the μ statistic ("support": 2.46) with respect to the variable "nodes" (3.57), as well as in the global sum, being for "support": 358.00 and for "nodes": 518. Therefore, it is necessary to consider whether these differences also differentially affect the DV: "improving", in order to consider the corresponding conclusions about.

Dependent Variable Explanatory Analysis

The explanatory analysis of the DV by the study factors was carried out using the univariate general linear model, by means of the test of between-subjects effects (see Table 3).

Table 3: Tests of Between-Subjects Effects.

DV: "improving"

Source	Σ Squares	df	μ^2	F	Sig.
Intercept	Hypothesis	8.44	1	88.41	26.21	.00
	Error	17.06	5.060	3.37(a)		
level	Hypothesis	.56	1	.56	14.75	.00
	Error	4.56	120	.03(b)		
age	Hypothesis	2.74	1	2.74	72.20	.00
	Error	4.56	120	.03(b)		
support	Hypothesis	1.62	5	.32	.65	.66
	Error	6.15	12.378	.49(c)		
nodes	Hypothesis	132.51	5	26.50	68.69	.00
	Error	5.01	12.989	.38(d)		
support * nodes	Hypothesis	7.35	12	.61	16.10	.00
	Error	4.56	120	.03(b)		

a) .10 MS (support) + .12 MS (nodes) - .07 MS (support * nodes) + .84 MS (error).

b) MS (error).

c) .79 MS (support * nodes) + .20 MS (error).

d) .60 MS (support * nodes) + .39 MS (error).

The univariate analysis test, which has been preceded by the Leven´s test of equality of error variance, indicates that contrasts are not equal, with each variable factor indicating a different variability of the explanatory variance with respect to the study DV (F: 16.05, df_1: 22, df_2: 122, sig: .00). It is therefore possible to analyse the data resulting from the study with the prior hypothesis of rejecting a hypothesis of equality of the explanatory variances on the DV. Indeed, as can be seen, the intersection of all the factors, which is the weighted sum of all the variables that have an impact on the DV: "improving" shows a highly significant data (sig: .00, μ^2: 88.44), which explains why the interactive set of all the factors analyzed significantly influences the variability found in the variable "improving". However, when the data are analyzed individually, highly significant inter- variables differences can be observed. Thus, the fixed variables "level" and "age" show critically significant data (sig: .00), the hypothesis for the variable "level" being (μ^2: .56) and to "age" variable (μ^2: 2.74).

However, what is most striking is the difference between the dynamic factors. Thus, the "support" variable shows a squared explanatory hypothesis (μ^2: .32), showing a critical level of non-significance (sig: .66) to F: .65. This is very important because it means that support, when not based on the cognitive performance of neural networks or nodes, does not have positive effects on the psychosocial development of people with ASD when measured separately. However, the isolated "nodes" measure, with or without the support measures captured by the "support" variable, shows a high explanatory level (μ^2: 26.50), which indicates a significant critical level (sig: .00), to F: 68.69.

This consideration prioritises the elaboration of neural networks between information contents during the didactic process over the presence of specific support aids. Thus, the presence of supports without the propositional consideration of the elaboration of meaningful relations between learning contents will not be effective despite the adapted methodological process; however, when such relations are developed, they are manifestly effective with or without organisational structural support. However, the interaction of the two variables "support" and "nodes" are again significant explanatory components of the variability found in the variable "improving", the explanatory hypothesis being: .61 (sig: .00, F: 16.10).

The plot of the residuals of heterogeneity of variances clearly shows the relationship between the predicted values and the typed residuals (see Figure 1).

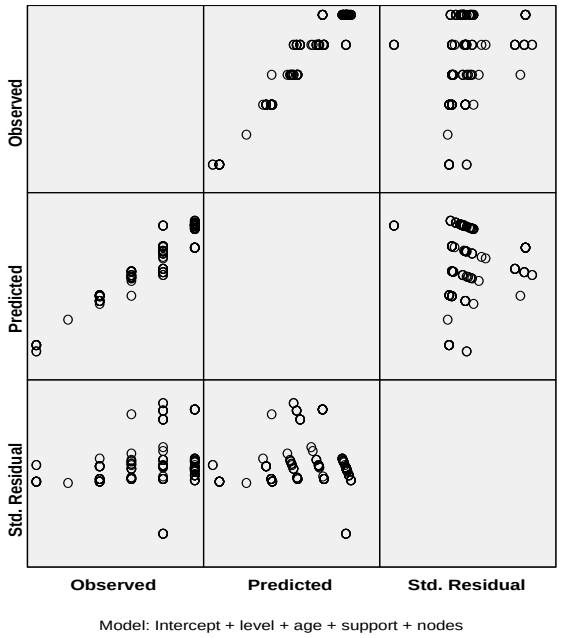

Figure 1: Residual Graph

Indeed, the above graph does not show homogeneity in the point cloud corresponding to the typed residuals across all predicted values, confirming the different variances between the predictor variables in relation to the DV.
These results have been confirmed by the ANOVA regression analysis for the factors influencing DV: "improving" (see Table 4).

Table 4: ANOVA(d) of Regression Analysis.

Model		Σ^2	df	μ^2	F	Sig.
nodes	Regression	277.51	1	277.51	1813.14	.00(a)
	Residual	21.88	143	.15		
	Total	299.40	144			
support	Regression	278.52	2	139.26	947.04	.00(b)
	Residual	20.88	142	.14		
	Total	299.40	144			
age	Regression	279.10	3	93.03	646.21	.00(c)
	Residual	20.30	141	.14		
	Total	299.40	144			

a) Predictors: (Constant), nodes.
b) Predictors: (Constant), nodes, support.
c) Predictors: (Constant), nodes, support, age.
d) Dependent Variable: improving.

As can be seen, the variable “nodes” is the first predictor variable to be included in the stepwise regression model and indicates the percentage of mean variance (μ^2: 277.51, sig: .00). This core variable is added the second step, that includes the variable "support", which also interacts to be significant (sig: .00) to broaden the level of explanation: μ^2: 139. 26. Finally, the regression model also includes the variable “age” as a predictor in its intersection with “nodes” and “support” variables, whose level of contribution to the model is μ^2: 93.03 (sig: .00).
The variable “nodes” stands out in its influence on "Improving" the psychosocial and academic development process, which interacts strongly with the variable “support”, but the latter factor alone does not exert a decisive influence on the explanatory variance of the study's DV, which is largely confirmed by the analysis of the coefficients of the regression analysis (see Table 5).).

Table 5: Coefficients(a).

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.
		B	Std. Error	Beta		
1	(Constant)	.23	.08		2.66	.00
	nodes	.96	.02	.96	42.58	.00
2	(Constant)	.37	.10		3.70	.00
	nodes	.96	.02	.96	43.36	.00
	support	-.05	.02	-.05	-2.61	.01
3	(Constant)	.42	.10		4.07	.00
	nodes	.96	.02	.96	43.76	.00
	support	-.04	.02	-.04	-2.02	.04
	age	-.05	.02	-.04	-2.00	.04

a) DV: improving.

As indicated, the origin of the regression line, expressed by the typed regression coefficients (Beta), is clearly defined by the importance of the occurrence of the variable "nodes", which define the core prediction of the DV of the analysis (Beta: .96, *t*: 45.581, sig: .00). For the constantly interacting "nodes", in the second step (Beta: .96) and "support" (Beta: -.05), whereas in the third step the constant is formed by the interaction of the "nodes" (Beta; .96), "support" (Beta: -.04) and "age" (Beta: -.04), for the *t*-analyses testing the hypotheses of population differential variances, significant critical levels were maintained in all cases.

DISCUSSION

Undoubtedly, the institutional and organisational process of support, from a systemic and systematic perspective, constitutes an important component in responding to the educational needs of students with specific characteristics, more specifically in relation to students with ASD, who make up the sample population of this study. The support projects must address all those involved in this process by facilitating a continuous and intensive application, according to the type and level of cognitive processing, in relation to the properly regulated executive neuropsychological process, for the purpose of progressive self-regulation, regarding the students for whom these supports are intended, within the framework of ordinary inclusive educational environments.

The framework of these supports must address the different areas of development:

1. The institutional legislative level, which is in line with the most recent measures in terms of conceptual development under the most recent empirical assumptions.
2. The level of school organisation, from the level of project development at school level to the level of the ordinary classroom and/or, where appropriate, the special environment that may be needed temporarily.
3. The area of specific curricular development, based on educational reinforcement, curricular adaptation or those specific organisational curricular measures of a greater dimension, such as diversification programmes or basic vocational training programmes.
4. The methodological-didactic delimitation of the support processes, both at the level of the school organisation and with regard to the time of execution.
5. The level of collaboration between the teachers involved and the relationships between them, their families and/or the social services that may intervene during the educational functional process.
6. The whole process should be followed by an on-site training process based on the initial approach with the participation of all factors involved in the initiated process.
7. The ongoing process of reviewing previous initial projects in accordance with evaluation plans that allow for the continuation or modification, in whole or in part, of the initial support proposals.

However, this whole interlinked process can be frustrated if it is not adapted to the basic principles of the specificity of people with ASD, i.e. it is not accompanied by a methodological specificity based on the continuous creation of informational relational networks between curricular and/or social contents within the planned didactic projects, so that any teaching-learning model must explicitly include a strategy of creating neural nodes or links between the target knowledge, facilitating the creation of meaningful conceptual categories that allow the working memory to fulfil its fundamental task, which is to facilitate the access

of these categorized contents to the permanent memory, where they will remain until they need to be retrieved according to the socio-educational requirements. Otherwise, the new material perceived at the initial sensory level, with or without the existence of the previous supports, will simply be lost due to the limitations of people with ASD to autonomously create those relationships that allow them to give semantic meaning to the new content with the help of previously learned related content.

In this way, higher order executive processes such as conceptual categorical hierarchies, processes of deduction and problem solving, and their theoretical application to functional practice in new situations, can be progressively granted (Fuchs et al., 2003), Otherwise, learning will be limited to automatic, mechanical or repetitive processes that do not involve higher-level applied cognitive work (Baker, Gersten & Lee, 2002; Biancarosa & Snow, 2004; Gersten et al., 2009; Vaughn, Gersten, & Chard, 2000).

These basic assumptions require at least the following strategic points to be taken into account in a series of steps during the teaching-learning process:

1. Check and build on each student's cognitively assimilated prior knowledge.
2. Analyse the best organisational strategy for extending the new content associated with the key corresponding to the previously assessed learning.
3. Incorporate the new strategy into a process of personal self-instruction to promote the autonomous functioning of intrinsic learning.
4. Establish a strategy of systematic, highly predictable steps in the learning process for the acquisition of new curricular and/or social content.
5. Perform repeated functional practices on the associated new theoretical construction within the conformation of acquired conceptual categories.
6. Facilitate along the functional process the self-regulation of the acquired learning process itself, so that it performs a functional and active work within the semantic memory system.
7. Control the new acquisition through a systematic process of continuous evaluation.

CONCLUSION

The discussion of the results is duly supported by the findings of this study. While it is true that such a general support system is necessary, and indeed there were individual cases where the support system led to partial success in curriculum development, although the specific score on semantic networking was relatively low, in general the support system alone will not address the improvement of the academic and psychosocial development of students with ASD if it is applied arbitrarily without taking into account the specific needs of this group.

Indeed, there are scores where there is hardly any specific complementary human or didactic support related to the presence of reinforcement, while when a highly meaningful didactic strategy was followed, the data on the improvement of academic and functional learning were evident. However, when there is interaction between the two components, i.e. the intersection of a properly systematised support project with didactics based on the development of meaningful neural nodes between curricular and social content, and when they are also practised in a functional way, semantic networks are built up in the permanent memory that not only facilitate integral development, but also serve as links or keys to retrieve this information for its application in solving similar or even new situations that may be proposed.

Conceptual units must be categorized by working memory so that the unit is not lost in a matter of seconds, for which the appropriate relationships between new stimuli and previous learning must be immediately established, whereupon working memory facilitates access to permanent memory in the form of new categories, which can then be re-connected through relational neural nodes so that learning can take place effectively.

In this way, the elaboration of networks creates a semantic field available for the elaboration of higher executive processes, whose intensity and executive quality (problem solving, creativity, imagination, fiction, deduction-induction, synthesis) will logically depend on the specific characteristics of each participant, but above all on the adjustment of didactic process, properly adapted.

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