Building Observational Skills - Secondary Benefit of Environmental Education

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Abstract

Attentional processes are important factors in the functioning of cognitive capacity and influence learning performance Attention develops gradually through exercise, becomes more and more organized, more flexible and more independent from the context (more autonomous); high attentional efficiency, synonymous with observational skills, allow the conscious and quick selection of relevant information, the easy manipulation of mental representations during the performance of certain tasks until their completion, the inhibition of distracting stimuli, etc. Due to their importance, the formation of observational skills should become explicit educational objectives. As a starting premise, different study disciplines participate in a differentiated way in the crystallization of observational skills, and biology and environmental education, through specific activities, ensure an increased yield in this sense. The present study aims to evaluate teachers' perceptions regarding the general level of students' attentional functioning, the general level of development of their observational skills, to carry out an analysis of the formative values of the various disciplines on the development of observational capacity. In parallel, it is proposed to evaluation of specific types of activities carried out within environmental education through the prism of the training potential for observation skills. The possibility of transferring attention skills acquired from one field to another is also of great interest. The instruments used in the study are the 10-point Likert scales and the results obtained indicate the opportunity to use environmental education, and not only them, as forms of exercise, flexibility and autonomous functioning of the attentional capacity and the development of observational skills

Keywords: *observational skills, attention, environmental education*

Introduction

Attention is considered to be an extremely important psychological process, a necessary prerequisite for the successful performance of any form of internal or external activity in which the subject engages [1] including, or especially, the learning activity. It is the reason why the school should put an important emphasis on the formation and training of attention, on the development of a skill to be attentive. Starting from childhood, from the stage in which attention is characterized by high instability and easy distractibility [2] its formation requires a gradual transition to concentration, focusing, shifting, cognitive involvement, informational selection, even absorption in the given task, etc. This transition requires time, constant voluntary effort, exercises, training. The results of this effort will condition the ability to extract significant patterns of informational inputs - the essence of learning [3] In turn, formed patterns help the learner to structure and understand the world in which they live, to develop their memory, to make valid adaptive predictions, to regulate, organize and plan their behaviors [4] for the purpose of a good adaptation.

The development of cognitive abilities takes place in parallel with an increase in self-control and impulse control skills, with the ability to ignore potential distractors, attention becoming more voluntary, more planned, more self-generated and controlled, more goal-oriented and sustained until the completion of its realization [5}. It is already a commonplace, valid for any age, that the higher the attentional capacity, the higher the performance in tasks that demand cognitive control; attentional control, flexibility and inhibitory control are good predictors of academic acquisitions [6]

In a pragmatic register, two concepts are frequently used for the instrumentalization of attention in order to increase the performance of the subject - the concept of flow and the concept of mindful

1 “flow”, defined as "a subjective experience of pleasure and concentration that usually occurs during the performance of tasks that are challenging, but that match the level of difficulty of the person's skill.”[7], or as “the experience of being completely and efortlessly absorbed in what one is doing” [8]. Absorption in a task during flow depends more on expertise (training), a high level of skill in certain

tasks that induce the experience of flow, than on general cognitive ability (by intelligence), so, the state of flow presupposes, first of all, the existence of trained skills, which are in balance with the difficulty of the challenge The term effortless attention has been proposed for this type of attentional state to differentiate it from the better-studied states of heightened attention during mental effort.

Among the functional coordinates of the state of flow, we mention: some that have a tangent with attentional capacities and those of attentional control:

-action-awareness fusion (actions appear automatic and little or no attentional resources are required, to execute sequences of actions);
- clear objectives;
- no subjective feeling of mental effort
- high concentration
- sense of control
- loss of self-awareness (self-reflective thoughts and fear of social evaluation are absent);
- time warping (time may seem to move faster or slower than usual)
- autotelic experience (performance is accompanied by a positive affect, which may be part of an intrinsic reward response - i.e. the performance of the task becomes an end in itself).

Flow state is associated with peak performance; in the modern informational world in which we are faced with a lot of distracting factors, and with a proportional decrease in yield, the state of flow, studies show, generates a 500% increase in productivity [9] Similarly, the state of flow is associated with the optimal and positive development of adolescents. [10], total concentration, enjoyment and intrinsic motivation in the activity. The balance between attention and the state of flow is still uncertain, the causal relationship between them is not known; it is only known that they are closely related, and that the state of flow is accompanied by an attentional state developed without effort, even if at the neurophysiological level the pattern is that of attention developed with effort [11]

The concept of mindfulness, with its origins in Buddhist philosophy, has become a topic of interest in psychology and neuroscience in recent decades as a tool to alleviate various problems, including stress, anxiety, chronic pain, eating disorders, nicotine addiction, not in the last row for increasing learning performance. Specifically, mindfulness is based on two main components (a) attentional regulation and control and (b) attentional focus training on the present moment in parallel with the habit of relating, emotionally detached, non-judgmental, non-evaluative to one's own thoughts and feelings, as in passing events of the mind; [12] Mindfulness practices, with an emphasis on regulating attention, and on metacognitive awareness of one's own experiences, have the ability to increase resistance to attention-distracting temptations, increase self-control, focus on the task [13] all of which suggest the role played by attention in mental functioning and social functioning in general, and there are arguments for the attentional capacity to be trained in order to increase performance.

This is not the time to develop the two concepts -flow and mindful- but only, through the involvement and benefits suggested by the research of the two fields on attentional functioning, to suggest the fact that the investment in attentional training is a productive one, with benefits in extended areas of functioning human (bodily, mentally, socially, etc)

In another vein, the need for attention training is also addressed, not always explicitly, by current educational practices. Each study subject included in the educational curriculum, for each of the schooling cycles, is justified by the contribution of information specific to its field and, in parallel, by the facilitation of the formation of skills/competences with different degrees of generality - some that are strictly related to the field of study, others called transversal, go beyond the field of study and are expressed through the following descriptors: autonomy and responsibility, social interaction, personal and professional development. Transversal competences are primarily characterized by transferability [14] in any field of knowledge; in the conditions of an informational environment and an indeterminable labor market for the future, they become important resources of adaptation (examples of transversal competencies: leadership, communication, problem-solving, teamwork and creativity competencies, among others). Some transversal skills are learned together with the scientific and technical ones, others are explicitly or implicitly introduced through inter-, multi-transdisciplinary approaches, as secondary benefits [15] but it is important to state that not all transversal skills are fully integrated in the educational training system [16]

In this context, the development of attentional capacities meets the qualities that transversal competences must fulfill - to ensure autonomy, responsibility, personal, social and professional interactions, transferable in any field of activity, etc. Each study discipline, included in the school curriculum, implicitly or explicitly, determines influences on the development of students' attentional capacities, through the learning activities it proposes.

Within them, biology, environmental education and the actions through which they are carried out (outdoor activities, taxonomic analyses, etc.) have a proven potential in increasing the intellectual and attentional functioning of subjects, both those with proven pathologies and those without such disorders [17] By their nature, the proposed activities meet the conditions required by the mindful principles for a good attentional functionality - forces the focus of attention on the present moment, requires non-judgmental records of the facts, advertises the skills that the subjects already have (the request to enter the flow state), obliges to orientation towards exteriority [18] etc. All these arguments recommend the valorization of the field of biology and environmental studies in ways that have as secondary benefits the training of the attention and attentional control of students of any age, along with the acquisition of the specific competences of the own field. The adaptation of the activities carried out within these fields could also optimize the development of transversal skills of attention training..

2. Applied Study

2.1. Study Objectives

The study proposes as objectives, i) the analysis of the school teachers' perceptions (teaching at different schooling cycles) on the general attentional functioning of their school students; in parallel, a similar assessment was carried out, with the analysis of students' (bachelor's and master's) self-perception on the same skills ii) the analysis of the level of educational training of some specific attentional characteristics (attentional stability, resistance to disturbing factors, detaching the logical essence of the message, observant spirit) and attentional self-control of pupils and students iii) analysis of the dynamics of evolution, along the schooling cycles (from primary to university education), of attentional capacity and attentional training capacity reflected in the perception of teachers and in the self-perception of university students iv) analysis of the role assigned by teachers and students for the valences of different subjects of the educational curriculum for training attentional skills v) analysis of the role assigned by teachers and students to different types of activities specific to environmental education for attention training.

2.2 Study Methodology

Using Likert scales, teachers (for different educational cycles) are asked to evaluate on a scale from 1 to 10 the level of development of the attentional capacities (general and specific) of their students, the role that the different subjects taught through the educational curricula they consider they have on the students' attentional development, and also to indicate the role that the activities carried out within environmental education have on the attentional development of their students (1 point is given to a very low level, 10 points to a very high level). In parallel, the same problems are subject to the self-assessment of students from the bachelor's and master's cycle. To analyze the attentional characteristics, were used items such as "the ability to resist attentional distraction", "the ability to easily notice the logical structure of the information taught", "the ability to differentiate between essential and non-essential elements in the environment or essential details from the non-essential ones in the information taught". For the analysis of the degree of attention training (education), the items used were: "the ability to stay focused and mobilize throughout the duration of a task" "the ability to resist the temptation to let one's thoughts "wander", " the ability to resist not checking one's phone/ facebook, etc. during educational activities", "the ability to self-assess and self-control one's own attention" and "the ability not to disengage (abandon) from task to failures, errors, frustrations". For students, the same skills were targeted, formulated in a self-referential manner.
As disciplines of the educational curriculum analyzed through the prism of the potential for stimulating attentional capacities, there were those from -scientific humanities - mathematics, physics, chemistry, biology, informatics -those from the humanities - literature, fine arts, foreign languages), the field humanities (social sciences, psychology) sports supplemented with the non-formal aspect of using technology (telephone, facebook, etc.).
The activities specific to environmental education evaluated, also through the lens of the potential to generate attentional training, were: analysis of the criteria for differentiating species of animals, plants, etc., concrete taxonomic analyses, microscopic analyses, experiments with the tracking of effects, identification of the mechanisms of the living world with establishing cause-effect relationships, activities in nature: planting, collecting samples, etc., monitoring the presence of polluting factors in the environment, dissections, observing transformations in nature starting from pre-established criteria

The study group is made up of 114 subjects, 18 male, 96 female, of which 50 are teachers (20 specialized in science, 30 from other fields) and 64 students. Among the responding teachers, 27 are in primary education, 13 are in secondary education and 10 in high school education; 31 of the teachers teach in the urban environment and 19 in the rural environment. Among the responding students, 41 are in the bachelor's study cycle and 23 are master's students, the vast majority of them (57) following humanities specializations.

2.3. Results

i) Within the study objective i) the analysis of the school teachers' perceptions (teaching at different schooling cycles) on the general attentional functioning of their school students and of students' self-perception (bachelor's and master's) on the same skills, at first glance the results seem to be optimistic

Table 1. The level of general attentional functioning and the level of functioning of the characteristics of attention

capacity	General attentional	maintaining focused attention	attentional distraction resistance	easily noticing the logical structure of the information	differentiating between essential and non-essential elements in the environment
mean	7,19	7,10	6,08	7,29	7,55
Std dev.	1,764	2,198	2,421	1,913	2,100

Regarding the averages given by the study group to the level of general attentional capacity and its specific characteristics, Table 1 indicates high average values (6.08<m<7.55 out of 10) for the evaluation/self-evaluation carried out for these criteria; the lowest values are attributed to the ability to "resist distracting factors", while the highest values to the ability to distinguish the essential from the non-essential (a factor strongly influenced by the subjects' cognitive variables). All the values in the table are located in the upper average register of the measurement scale, which would indicate the existence, in the group average, of good attentional capacities. Upon closer analysis, these data indicate two trends that are incompatible with each other; the attenuated ability to resist attentional distractions, are an indication of the defective functioning of attentional focus.This results indicates that a greater accuracy of the results would require a specific analysis, during the educational activities, of each subject for each of the analyzed dimensions. external perceptions, in the case of teachers, and students' self-perceptions can mask hidden variables

Table 2. Level of training and attentional control (attentional discipline)

capacity	to stay focused and mobilize throughout a task	to resist the temptation to let one's thoughts "wander"	resists not checking phone/ facebook etc during educational activities	to self-assess and self-monitor one's own attention	do not disengage (abandon) from the task at failures, errors, frustrations
mean	7,14	5,17	5,5	4,52	6,11
Std dev.	2,283	2,492	2,112	2,621	2,750

ii) For the analysis of the perceived training level of attentional capacities (Table 2.), pupils and students do not seem to have well-developed abilities of self-evaluation and monitoring of their own attentional functioning (m=4.52), results correlated with the tendency to "leave thoughts to wander", of "using phones during educational activities", with " diminuated capacity of resistance to distracting factors" speak of a deficit of attentional self-discipline. In the same analysis register, the high ratings for the ability "to stay focused and mobilize throughout a task" are incongruous with those of "to self-assess and self-monitor one's own attention". As a whole, and the results regarding the training of attentional capacities, the decreased values (located in the middle register of the variation scale), are incompatible with the evaluations of attentional capacity (with higher average values). A possible explanation of these incongruities could be the high attentional fluctuation/inconstancy of the pupils/students, -moments of high functioning (surprised by the teachers and the students self-perception) that alternate with moments of dysfunctionality (justified by the average ratings of attentional control capacities. For the nuance of the results, it is necessary to take into account the fact that the evaluation of the attentional characteristics of the school students was a global one, carried out by the teachers, while the analysis of the attentional characteristics of the university students was carried out through individual self-evaluation, a fact that can induce alterations of the results. Breaking

down the results, the teachers rate all the students' attention skills at least one point lower than the average of the group as a whole, a trend that is also maintained for the attention self-discipline items.

Table 3. The influence of the education cycle on the development of attentional capacity and its characteristics.

	F	sig
General attentional	F=5,275	p=0,002
maintaining focused attention	F=8,213	p=0,000
attentional distraction resistance	F=12,728	p=0,000
easily noticing the logical structure of the information	F=17,395	p=0,000
differentiating between essential and non-essential elements in the environment	F=22,867	p=0,000

iii) Of course, the fact that educational capacities are in an evolution due to age, maturation and training cannot be neglected here either. The variant analysis carried out in this sense (Table 3 indicates statistically significant changes ($p<0.05$) in the values of all analyzed attentional capacities. The attentional dynamics takes place according to the constant pattern of increasing the average value with the increase of the schooling cycle (from an average of 6.78 in low schooling, to an average of 7.72 for "general attention capacity" during university studies; from an average of 6.04 to 7.91 for "maintaining focused attention"; from an average of 4 .56 to 7.16 for "attentional distraction resistance"; from the average of 5.63 to that of 8.19 for "easily noticing the logical structure of the information" and from 5.93 to 8.69 for "differentiating between essential and non-essential elements in the environment" - the last two reaching the highest rates, from the data series, attention increases being supported by cognitive variables)

Table 4. The influence of the level of education on the the development attentional discipline

	F	sig
Capacity to stay focused and mobilize throughout a task	F=5,393	p=0,002
Capacity to resists not checking phone/ facebook etc during educational activities	F=12,624	p=0,000
Capacity to self-assess and self-monitor one's own attention	F=20,863	p=0,000

Disciplinary attention capacities do not enjoy the same significant variation - out of the five attention capacities analyzed, only three of them will be statistically significantly influenced ($p<0.05$) by the variable "schooling cycle" (Table 4.) These are: "to stay focused and mobilize throughout a task", "to resist not checking phone/ facebook etc during educational activities" and that of "to self-assess and self-monitor one's own attention". Another difference compared to the evolution of attentional capacities, within the attentional discipline capacity, the ranges of variation are narrower compared to the previous variables: from an average of 6.11 for low schooling to 7.89 for university students for "capacity to stay focused and mobilize throughout a task", from 4.37 to 6.09 for "capacity to resists not checking phone/ facebook etc during educational activities" and from 6.19 to 7.94 for "to self -assess and self-monitor one's own attention". It does not surprise us at all that the lowest values are obtained for resistance to the use of telephones, common sense constantly signals this ubiquitous functional attentional disturbance, at all ages. Without significant evolution, as the increasing of schooling experience, maturation, etc.they seem to be the variables of "resisting the temptation to let one's thoughts "wander" and "do not detach (abandon) the task at failures, errors, frustrations". dimensions that have emotional rather than cognitive coordinates.

The analysis of the potential that the subjects taught through the educational curriculum have to strengthen the discipline/attentional training and through this, the attentional capacities of the students (objective iv), indicates different values (Table 5), all being located in the upper third of the variation scale for all the subjects analyzed. These results indicate that the teachers, along with the students, recognize the value that the curriculum has on attention.

Table 5. Potential of the study subjects for the training and development of attentional capacities

Educational fields	Potential of the study subjects for the training and development of attentional capacities				
Sciences	Mathematics	Informatics	Physics	Biology	Chemistry
Teacher' s mean	8,52	8,82	7,76	8,46	7,7
Student's mean	7,94	8,41	7,09	7,72	7,28
Arts and humanities	Literature	Foreign languages	Plastic arts	humanistics (philosophy, psychology	Economy
Teacher' s mean	8,58	8,16	8,02	7,72	7,32
Student's mean	8,47	8,56	7,81	8,03	7,44
Other field	Sport			Using social media (phone, facebook, etc)	
Teacher' s mean	8,68			7,64	
Student's mean	9,03			6,75	

A ranking of the study subjects according to the formative value of this transversal competence (the capacity and discipline of attention), as the teachers perceive the situation, indicates some trends: a part of the study subjects have values that exceed the average of 8.5 (which suggests extremely high potential for attentional development) - we name here, in descending order of average values, Computer Science (m=8.82), Literature (m=8.58), Mathematics and Biology (m=8.52). Atypically in this hierarchy, sport is ranked second among the educational disciplines that facilitate the development of attention. A second category of disciplines are grouped around the average value of 7.7 from the perspective of the criterion of stimulating the development of attention: (Physics m=7.76, Socio-humanistic disciplines, m=7.72; Chemistry m=7.7 and plastic arts (m=8.02) followed by the use of technical means (m=7.64) and economic subjects (m=7.32) having the lowest perceived potential to stimulate the students' attention.

A second trend noticed is that of significant differences ($p<0.05$), approximately 0.5 points on the scale of variation, of the students' perception compared to the teachers' perception, for almost half of the disciplines analyzed; in most cases, students underestimate the formative value for attention of the subjects studied through the curricula, atypical in this context are the students' perception of sports, foreign languages, socio-humanistic subjects. Interesting results are those aimed at the influence of the use of telephones, facebook as learning tools on their attentional capacities - the students having a modest appreciation (m=6.75) for the purpose analyzed - the formation and training of attentional capacities. An aspect related to the specifics of the study group should not be neglected - the vast majority of teachers and students tended to recognize the potential of their own fields of study, knowing the others insufficiently; in this case, because most subjects come from the humanities fields, the quotas of these subjects were slightly overestimated, however, they recognize the contribution made by the other specialties for the development of attention, the proof being the general raking

Significant for the present study is the confirmation of the starting hypotheses - in which biology and the study of environmental education are disciplines that have a high potential for stimulating the attentional capacities of students and on the acquisition of an attentional discipline - at any age, competencies useful in assimilating all other information and competences. The average obtained (m=8.52), in the teachers' perception, places biology it in the third position of the study subjects with the highest potential, next to mathematics. The same cannot be said for students, who perceive a lower value of environmental subjects for attentional development; it is significant here that the majority of students, coming from humanities fields, have a more superficial mastery of the field of study analyzed

The deepening of the analysis comes with the proposal of specific activities carried out in the course of teaching/ application/ research in the biological and environmental field and their evaluation from the perspective of their formative value for the development of attentional capacities and discipline. (objective v) A ranking of these potentialities is included in Table 6

Table 6. Analysis of the potential of stimulating and disciplining the students' attention that the activities specific to environmental education and biology have

means	Analysis of the potential of stimulating and disciplining the students' attention that the activities specific to environmental education and biology have				
	Taxonomic analyses	Learning the specific criteria that differentiate the families of living species	Microscopic analyses	experiments with tracking effects	Identifying the mechanisms of the living world, establishing cause-effect relationships
Teacher' s mean	8,3	8,22	9,02	8,74	8,74
Student's mean	7,91	7,91	7,77	8,28	8,28
	Activities in nature (planting, collecting samples, etc.)	Monitoring of polluting factors in the environment	Dissections	Observing transformations in nature starting from predetermined criteria	
Teacher' s mean	9,34	8,42	7,9	8,6	
Student's mean	8,72	7,56	7,69	8,09	

Even in this case, the ranking of the activities in terms of the potential for attentional development shows the same trends as in the case of the analysis of the study subjects: the teachers tend to assign significantly higher attentional stimulation potentials for all the proposed activities, All the values recorded by the students and by the teachers are in the upper quarter of the variation range of the scale, which denotes high and very high importance (7.56<m<9.34) in the role of attentional development. The most valued activities by teachers seem to be "Activities in nature (planting, collecting samples, etc.) (m=9.34) followed by "Microscopic analyses" (m=9.02) followed by groupings around the average value of 8.2-8.4 of ”taxonomic studies” and ”applications and environmental monitoring” (activities whose essence is based on attentional capacity - potential unnoticed by these evaluations) and another category with intermediate values (m=8.6-8.7) for ”identifying mechanisms, links causes-effects, etc”.) The weakest potential for attentional development is given by dissections. The same grouping tendency is also registered in the students' perceptions. An observation should be made here - the attribution of potentials, by teachers and students alike, seems to be based more on motivational factors - the activities that they are used to and that bring pleasure are rated as stimulating the attentional capacities of the respondents. The importance of motivation in attentional activation is well known, but educationally, it would be useful to deepen this difference - between what gives pleasure and what is useful.

2.4. Conclusions

In the evaluation of the attentional capacities of the pupils and students, the results indicate relatively high average values (in the upper third of the variation range of the scale) but the level of attentional training, paradoxically, is evaluated to be behind that of attentional development. The deficits recorded in the dimension of attentional control are largely related to not resisting "checking phone/facebook etc", "temptation to let one's thoughts "wander", and the difficulties "to self-assess and self-monitor one's own attention". These tendencies are frequently noticed by the common sense and are accused of decreasing the performance of school reception. Compensatory, the analysis of the potentialities that different study subjects have on the development of the capacity and attentional control indicates high potentialities; in this sense analyzed, those of biology and environmental education, through the activities they propose, have the value of building transversal competences of the attention register.

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