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	Particle	
	Given Name	Giorgio
	Prefix	
	Suffix	
	Role	
	Division	
	Organization	University of Ferrara, Ferrara via Ludovico Ariosto
	Address	35, Ferrara, Italy
	Email	giorgio.poletti@unife.it
	ORCID	http://orcid.org/0000-0002-7270-6083
Author	Family Name	Gramigna
	Particle	
	Given Name	Anita
	Prefix	
	Suffix	
	Role	
	Division	
	Organization	University of Ferrara, Ferrara via Ludovico Ariosto
	Address	35, Ferrara, Italy
	Email	
	ORCID	http://orcid.org/0000-0001-9147-8832
Author	Family Name	Righetti
	Particle	
	Given Name	Marco
	Prefix	
	Suffix	
	Role	
	Division	
	Organization	Laboratory of Education Epistemology of University of Ferrara
	Address	Ferrara via Paradiso 12, Ferrara, Italy
	Email	
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Keywords
(separated by '-')

Cognitive styles - Learning - Interactive technologies - Knowledge



Knowledge Building Processes Between Interaction and Collaboration

Cognitive Fields and Learning Processes

Giorgio Poletti¹ , Anita Gramigna¹ , and Marco Righetti²

¹ University of Ferrara, Ferrara via Ludovico Ariosto, 35, Ferrara, Italy
giorgio.poletti@unife.it

² Laboratory of Education Epistemology of University of Ferrara, Ferrara via
Paradiso 12, Ferrara, Italy

Abstract. Knowledge building processes are involved in epochal changes that affect society. It was deemed necessary to start a study on the effects of these changes and processes on training practices and their models, also considering the consequences, not always explicit, that both of them have towards behaviors and values. The work also starts from the consideration, which many researches have highlighted, of how communication technologies and society are factors of great influence on learning-teaching processes. The learning-teaching processes are often integrated by blended methodologies and technologies certainly increase the factors of connection and interaction between the actors of the formal, non-formal and informal training processes. A balanced and preparatory analysis of effective practices is based on knowledge of learning processes and cognitive practices. The work describes the first phase of the research, an exploratory research on teachers' perception on the relationship between cognitive styles, learning and technologies integrated in the learning-teaching processes. The first part of the research started from the investigation of the teachers' thoughts, from their "feeling" of how the world of technologies and their pervasive use influenced cognitive styles and, in any case, students with school skills and attitudes secondary, regarding learning processes. From the result obtained, the second part of the research was developed which investigates the processes of building knowledge and which the situation of Pandemic has prevented from carrying out in the expected times. For this reason, the first phase of the research and the theoretical structure of the next phase are presented, in terms of methods and objectives.

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Keywords: Cognitive styles · Learning · Interactive technologies · Knowledge

1 The Research Project

1.1 Purpose of the Research Project

The research project that has developed started to detect teacher's thoughts, from their "feeling" of how the world of technologies and their pervasive use has influenced cognitive styles, and in any case on students' skills and attitudes, relatively to learning processes.

The aim was to detect teachers' thinking in relation to the "assessment of cognitive trends" in order to be able to reach pedagogical models to detect and optimize cognitive processes.

A further aim, pursued with a research-action on didactic processes. This phase was intended to respond to a challenge of education in the digital age.

The challenge is to combine the growing availability of technologies with the activation of new skills, and respond to new educational needs by knowing the cognitive styles.

The intended contribution is to indicate through which technology, in a broad sense, integration into the learning-teaching processes is possible. It was intended to clarify that technology is not only an aid for a "better" or "less tiring" learning path.

Technology changes the approach to cognitive processes, people's approach to the reality around them, to understand it and interact with it.

In short, it can be said that it pushes us to understand how each of us builds knowledge.

This project intends to focus on the problems related to the analysis of cognitive fields. Two aspects will be considered:

- the critical issues found in the cognitive approaches of adolescents (difficulty of concentration, attention, abstraction, motivation, synthesis, solipsistic behaviors);
- how a conscious use of cognitive approaches helps teachers analyses the cognitive habits and therefore the difficulties and strengths of their students, as well as to activate a metacognitive approach to school knowledge.

The practical impact is to include technologies in teaching and not to have a classroom for technologies, a method that has proven useful for increasing the level of learning.

1.2 Methodological Approach

The aim of the project, which started with an initial exploratory research, is to propose a school that aims to enhance the talents of both teachers and students.

The research project has a qualitative imprint and began, with the exploratory action to detect teachers' thoughts, their "feeling" of how the world of technologies and their pervasive use has influenced cognitive styles, and however on the skills and attitudes of students, in relation to learning processes.

We chose to use questionnaires that use Likert scales, in order to have a first feedback in relation to the focus of the research project, substantially placing some statements to the evaluation of the teachers with respect to their opinions on cognitive trends.

The questionnaires also collect information on the profile of teachers to frame opinions also in relation to training and therefore to their cognitive styles.

The sample of teachers can be defined as random, the distribution reproduces a "realistic" situation; for example, to make a comparison with a certain figure in Italy, according to an OECD estimate 83% of teachers are women, which is comparable with 80.9% of the sample, as well as the relationship between the different disciplinary areas.

The second phase of the research made use of survey questionnaires on the use and results of technologies in training processes.

The teachers used observation sheets and the students filled in the questionnaires. The data analysis was done both from an interpretative point of view, as regards the impressions of the teachers on cognitive styles and from an interpretative point of view as regards the results obtained with the students.

The data and analyses, including tests with Cronbach's Alpha, highlight the repeatability of the learning improvement in relation to use of technologies, understanding of the construction of knowledge and definition of cognitive styles.

In the final phase of the research, we will analyse the critical issues found in the cognitive approaches of adolescents and it will be shown as a conscious use of cognitive approaches. In this, we will analyse, in a systemic perspective, fundamental elements that characterize the structure of a cognitive field:

1. **ability to identify the relationships** between the part and the whole of a context;
2. **proposal of exercises** that have a clear metacognitive depth;
3. **ability to identify the virtuous relationship** between training needs and school proposals.

The approach will still be qualitative: the relationships between data and information will be analyzed from a systemic perspective. However, the numerical and statistical aspects of data and information will also be analyzed.

1.3 The Analysis of Cognitive Fields

This phase of the project intends to focus on the problems related to the analysis of cognitive fields and cognitive modifiability. Habits, in fact, are "cognitive paths" [1], experimented models of behavior with which we relate to the world, are learning patterns that presuppose points of view.

These paths draw the limits and potential of the cognitive field.

However, it is also true that they are likely to change, expand, interconnect, restructure or disappear with the activation of other fundamental knowledge.

In fact, the basic, basic knowledge that the school builds with its protagonists makes sense if all the subjects involved in the training game are aware that, while building knowledge, they activate a series of acquisitions that they will use, at least in part, in other contexts. These are metacognitive learning.

When we talk about cognitive functions, we refer to basic cognitive and coordination processes.

Among the basic cognitive processes, we consider the following: perception, emotion, attention, memory, language (amplitude and plurality of vocabularies, mastery and precision), and empathy.

Among those of coordination, we consider the following: plurality of linguistic styles and interaction, visual-spatial and topographical orientation, operativeness and praxis, abstract thinking, intuition, creativity, cognitive awareness of oneself.

The goal that this phase of the research project has is to give answers to what are considered fundamental questions in relation to the study and cognitive fields, in their definition and determination.

The questions that are considered fundamental and to which you intend to answer, in summary, are:

- What are the well-developed cognitive functions and what are they lacking based on standard paradigms recognized by the literature?
- What are the emotional problems that hinder the execution of a task or learning?
- What processes facilitate it?
- What strategies for potential cognitive functions?
- What is the extent of the improvement that we can expect?
- What are the linguistic and relational assumptions that can trigger change?

The definition of these questions is also functional to what you intend to do and that is:

- analyze the criticalities found in the cognitive approaches of adolescents (difficulty of concentration, attention, abstraction, motivation, synthesis, solipsistic behaviors);
- showing the conscious use of cognitive approaches helps teachers analyze the cognitive habits and therefore the difficulties and strengths of their students, as well as to activate a meta-cognitive approach to school knowledge.

The research phase foresees a preliminary bibliographic survey on the international debate, where the following fundamental elements that characterize the structure of a cognitive field will be analyzed in a systemic perspective:

- **ability to identify** the relationships between the part and the whole of a context;
- **proposal of exercises** that have a clear metacognitive depth, or that do not aim exclusively at the training of specific functions, but rather that, at the same time, develop similar or close functions, that is, which activate a structural change in the boy;
- **ability to identify** the virtuous relationship between training needs and school proposals.

To this end, cards, questionnaires, structured and semi-structured interviews will be prepared to be submitted to a significant sample of teachers and students.

The disciplines involved are:

- pedagogy, in its epistemological and experimental aspects;
- philosophy of education.

Research Method. A qualitative approach was chosen based on the purpose and scope of the research, an approach for analyzing the relationships between data and information in a systemic perspective. However, the numerical and statistical aspects of data and information will also be analyzed. We are convinced that an intelligent consideration of quantitative data leads to qualitative considerations and hypotheses, but the opposite is also true.

Research Strategies. The strategy applied is that of the analysis of notable cases and the collection, cataloging, analysis of experiences, data and information. Action rich with teachers and students. The internalized action that is accompanied by the competent guide of the teacher becomes a mental operation. The boy learns the procedural

sense as well as the different strategies that, in other contexts, this procedure can activate. This event shows us that it is possible, on the one hand, to study the directions of a cognitive field, on the other, to improve its mental abilities. The metallization of a procedure, of an operative choice, of a strategy aimed at solving a problem, implies the competence of the teacher in guiding the reflection on the evidences, on the gestures, on the operations. In this way, it is possible to correct the structure of cognitive functioning, rework the action plans, and improve their critical issues. In a word: increase learning potential. The teacher learns about the cognitive habits of his students, identifies their resources with weak points, and uses error as a concrete opportunity for strategic rethinking.

Reference Epistemology. The reference epistemology refers to interpretative pedagogy [2], narrative pedagogy, and hermeneutics. This knowledge is not based on the possibility of an exchange, of their mutual help and therefore on the synergistic action of different styles of thinking, cognitive approaches, intelligences. The unity of meaning, the epistemic link, the eidetic structure is the RELATIONSHIP. The epistemic values adopted establish and elaborate a hierarchy of criteria aimed at justification, that is, at the consequentiality of our knowledge theory in relation both to its applications and to the theoretical and methodological premises. From the above, an epistemological perspective of a hermeneutic character emerges. The network of structures is organized in an elastic, dynamic, highly integrated and, at the same time, open hierarchy. It is an organizational framework of knowledge with which we interpret and build knowledge, it therefore has an active and concrete tension. Active, because it acts on reality and regards both the processes, the acquisition, the construction and the organization of cognitive data. And it is concrete, because it refers to the way we see the world, to the questions we ask ourselves when we act and that direct our conduct, it concerns the hypotheses of our research and its processes.

Check and Evaluation. The verification of our project requires a rigorous procedural analysis of the following fields according to the criterion of their mutual coherence as well as the coherence between methods, activities, tools, epistemology and objectives. The fields of verification and analysis, specifically are:

- the processes of construction, organization, dissemination and trans-formation of knowledge;
- the methods, the contexts of meaning and the conditions of their construction;
- conditions, in turn, pose the problem of verifiability of these constructions (for example: when and to what extent does knowledge have criteria of truth, certainty and efficacy?).
- the choice of information that experience suggests to us, their interpretation and their placement within our system of knowledge;
- the relationship of these processes with our cognitive self, or with the conscious and non-conscious perception that we have both of our cognitive field and of our potential for acquisition, elaboration, invention;
- specific language of the disciplinary approaches involved, field of study and application, peculiarities of the contents, method, procedures, theoretical

background, consequentiality, verifications, tools and coherence of the meaning and procedural relationships that exist between them.

The evaluation criteria will take into account the following points:

- the parameters on the basis of which we evaluate the impact that these problems have on the present;
- epistemological assumptions, including implicit procedures;
- methodological consistency with these assumptions;
- the conceptual tools, the theoretical background in the international debate;
- the reference theories;
- the criteria for a constant revision of the model and its strategies;
- the means of observation, collection, cataloging and documentation;
- the tools for verifying and evaluating the results of our research in relation to the objectives, assumptions and means that we have been able to use;

The consistency between all these elements and the possibility of their rearrangement.

2 Cognitiveness and Teachers: What They Think

2.1 Research Environment

The research started from the survey of teacher's thoughts, from their "feeling" of how the world of technologies and their pervasive use influenced cognitive styles, and in any case on students of secondary school skills and attitudes, regarding learning processes.

It was decided to use a scale based on a Likert scale, in order to have a first response in relation to the focus of the research project by substantially placing some statements with respect to their evaluation of cognitive trends to the teachers' evaluation [3].

It was decided to use an "online" system for the administration of the questionnaires and specifically, through the school managers, the link to fill in the questionnaire was disseminated.

On the one hand, the choice was dictated by the need to have rapid feedback and on the other by the reflection that in order to refine a more in-depth questionnaire and the development of teaching strategies to experiment, it would be significant to gather opinions without posing a segmentation problem.

The focus was on secondary school teachers, even if vertical plexuses were also contacted, and questionnaires were obtained from teachers of primary and secondary level.

The questionnaire, which was accompanied by a letter of introduction, declared the purpose of the project, of which it was the starting action, namely an analysis and a subsequent pedagogical proposal for a school that values the talents of all those who live there.

The questionnaire was divided into three sections and was intended for a brief but meaningful compilation.

The first section was the compilation of data relating to the compiler in relation to the educational qualification, area of study, gender and age.

The second section collected data related to teaching and the order and grade of the school and the disciplinary area, together with the survey of the length of service (how many years have you been teaching?).

The last section is the fundamental one “ASSESSMENT OF COGNITIVE TRENDS” for the detection of teacher’s thinking and to be able to continue with the structuring of the project to define pedagogical models to detect and optimize cognitive processes.

This section consists of three questions, two closed and one open to collect suggestions and feelings from the teachers.

The first question is “In recent years, young people have been the subject of a bombing of information and very rapid stimuli, which seems to have made it difficult, if not annoying, to experience situations that require slow rhythms”.

Thinking back to his experience as a teacher of the last few years, how much do you agree with the following statements?”; in relation to this question possible answers are given that complete the statement The students have worsened the capacity of..., and the statements are:

- identify the differences (ANALYSIS)
- classify the identified differences
- elaborate integrations between different elements (SUMMARY)
- to establish sets of elements based on the principle of affinity or congruence
- encode and decode a message, a language, a code, an instruction, a program...
- identify key words that connote an event or process
- to identify the relationships between the part and the whole of a context
- activate collaborative and supportive social behavior

And for each statement you are asked to choose between the options of a Likert scale:

- Totally agree
- Partially agree
- Neither in agreement nor in disagreement
- Partially disagree
- Totally disagree

Similarly, the next question, which contains a single statement; the question is Overall, considering his experience, to what extent do you agree with the following statement? and the statement to “evaluate with the same Likert scale seen above is: The massive attendance towards technological apparatuses by children and young people has played a main role in changing their approach to learning in the dimensions identified in the previous table of affirmations. The collected questionnaires are 204.

2.2 Search Results

Analyzing, from a percentage point of view, the data once again the sample seems to be always satisfactory with a view to reliably analyzing the sensations with respect to the learning trends and being able to prepare design and analysis tools to continue the project.

Table 1 .

Students have dropped the ability of...	A	B	C	D	E
... identify the differences (ANALYSIS)	54	108	24	15	3
... classify the identified differences	69	102	21	9	3
... elaborate integrations between different elements (SUMMARY)	108	75	12	6	3
... to establish sets of elements based on the principle of affinity or congruence	66	87	33	12	6
... codify and decode a message, a language, a code, an instruction, a program	87	81	21	12	3
... identify key words that connote an event or a process	48	93	27	33	3
... to identify the relationships between the part and the whole of a context	78	81	30	12	3
... activate collaborative and supportive social behavior	48	78	36	27	15

A: Totally agree - **B:** Partially agree - **C:** Neither in agreement nor in disagreement - **D:** Partially disagree - **E:** Totally disagree

The data relating to section three are the central ones that led to a first reflection and a first confirmation of the feeling that one had in the various contacts with the schools. In summary, see Table 1, the data collected in the third section with the reflections that they led.

A first overall reading of this table shows the detection by teachers of a deterioration of certain skills; in fact, if we add the totally with the partially in agreement, we can see that there is an evident detection of this deterioration.

There is an almost total concordance in detecting a diminished or worsened capacity for synthesis where there is an 89.7% of interviewees completely or partially in agreement with the statement.

Similarly, there appears to be evidence of progressive deficiencies in the ability to classify differences (83.8% Totally + Partially in agreement). Of interest is to note that a very high percentage 82.1% (Totally + Partially agree) shows a diminished ability to encode and decode a message, a language, a code, an instruction, a program, where undoubtedly today the relationship with technologies is privileged and the technologies themselves are pervasive.

This is certainly a first indicator of where to continue an investigation, because this result highlights how technologies become memory substitutes and information cataloging, also explaining the need for schools to push for coding, for the development of computational intelligence.

The aspect of coding and the development of computational thinking, as well as emerging need in the school explains why, in the analyzed questionnaires there is a strong correlation between those who disagree, partial or total, with the statements and their membership by training or teaching area for the technological areas. Probably in this case it is evident that technology and technology are too often confused and that the ability to use tools is “confused” with new learning styles, which in some way displace the previous ones.

A separate discussion and of interest also for the relational area are the “reactions” to the affirmation the students have worsened the ability to activate collaborative and supportive social behaviors where 61.5% agree completely or partially but disagree total or partial there is a 20.6% and a percentage of neutrals of 17%. This is interesting because it reveals what is the influence of social networks that are judged on the one hand a source of isolation, and even more serious problems such as cyber-bullying and on the other hand to increase socialization and all those collaborative stimuli useful not only in new social processes but also in learning processes [4].

On the other hand, there is a clear indication from the analysis of the reactions from the last statement. The massive attendance towards technological apparatuses by children and young people has played a main role in changing their approach to learning in the dimensions identified in the previous table of affirmations, relating to the question Overall, when thinking about your experience, to what extent do you agree with the following statement? This result, even in all the facets seen in the individual reactions to the other statements, confirms that the pervasiveness of “intelligent” technologies and tools is felt as a “cause” not only of social and relational changes but also in the way in which individuals they relate to the construction of knowledge and the same cognitive styles. The project therefore encouraged by the observation that what were “sensations” are strong evolutionary impulses even within the school and that these thrusts sometimes generate problems that must be tackled in a structural manner.

We work and study to be able to say with the philosopher William James, “*The greatest discovery of my generation is that human beings can change their lives by changing their mental habits*”.

3 Conclusions, Results and Perspective

A first overall reading of the data collected in the first phase of the research highlights the detection by the teachers of a deterioration in certain skills; in fact, if you add up the totally with partially the agreement it shows how there is a clear detection of this worsening.

There is an almost total agreement in detecting a decrease or worsened synthesis capacity. A very evident interest 82.1% (Totally + Partially agree) shows a decrease in the ability to encode and decode a message, a language, a code, an instruction, a program, where without doubt the relationship with the technologies are preferred and the technologies themselves are pervasive.

The data collected from the second phase of the experiment, the results obtained and the evaluations of the documents have meant that, otherwise necessary additional

experiments are needed in this regard, that the technologies thus used and tested in this work help to improve the capacity of the SYNTHESIS... elaborated integrations between the different elements (SUMMARY) that had been identified, from the initial research among teachers, as a lack generated by a pervasive use of technologies. It can be said that the use of interactive technologies and content creation processes in formal learning processes increases the ability to synthesize and metabolize knowledge together with the facilitation of inclusion processes, which develop the development of collaborative and cooperative collaborative skills.

The results in summary can be said that the technologies have proven useful in two specific directions: the pursuit of the structure of knowledge for better understanding and the use of technologies for experimentation, but at the end of the methods of solving problems, learn to learn.

From the last phase of the research we expect to define the aspects again, also seeing the change in a period like this, where the pandemic has increased the abuse of technologies in a social and relationship context devastated.

Talking about learning-teaching means paying attention, as has been done in research, to the learning processes, focusing on the student and his dynamics with which he relates to learning.

The teaching and learning processes cannot be separated from the knowledge of the mdi with which the mind builds knowledge and which are still cognitive that are used.

Error learning, the construction of methodologies that is not only a diversified technology but also a different knowledge, there is the information of which the research results have highlighted the possibility and the integration of technologies in the learning procedures- teach how to enhance and improve cognitive anchors.

An efficacy that has among the strengths of the theoretical basis of the observation of cognitive anchors and learning methods.

The technologies, whether they are software or hardware, which allow the development of analytical knowledge tools or the strengthening of proactive approaches to knowledge, are the key to a training that becomes the students' ability to be in continuous training.

Research, therefore, compared to the factual situation has shown the importance of knowing the other student's cognitive and how it is possible to increase the ability to learn with the use of technologies guided by a methodology that has an unavoidable basis in the knowledge of cognitive fields.

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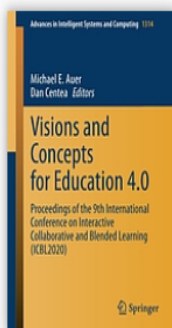
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