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FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES

„EDUCATION, REFLECTION, DEVELOPMENT" DOCTORAL SCHOOL

THE FORMATIVE VALORIZATION OF SPONTANEOUS MEDIA INTAKE IN FORMAL EDUCATION

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KEYWORDS

Digitization, generation gap, digital citizenship, critical thinking, digital literacy, media intake, digital games, affinity spaces, formative media intervention program.

INTRODUCTION

The 21st Century witnesses the steepest ascending trend of technological advancement in history, which is felt in most areas of activity. But while in other areas such as economy, justice, culture, health, etc. technology is implemented and integrated selectively, in accordance with possibilities and resources, education, in addition to its own technologisation needs to know and address formative demands according to the changes made in all the fields for which it forms labor force.

A possible solution to the problems education is facing at present would be to promote policies that allow for a flexible, organic structure of the whole educational system, so that the education institutions and especially the higher education ones can have a high-enough degree independence as to enable demand and supply to be adjusted dynamically in accordance with their own needs and opportunities, as well as those of the mediums with which they are in close interdependence relations.

While changing policies in such a way would be almost impossible, it is not only possible to change educational views at an educator or institution level, but even accessible, given the context of available technological means and their potential.

This work aims at contributing to the flexibility of the educational process by providing a praxiological framework in the form of a formative intervention model aimed at promoting interdisciplinary approaches, in line with the principles of integrated learning, and harnessing the potential of implicit learning, by means of available digital means which are highly familiar to learners.

Through adequate channeling of spontaneous media intake in formative ways, skills can be developed in absence of the perceived effort by the learner, ensuring better integration of knowledge with lesser perceived effort.

CHAPTER I – DIGITALIZATION AND THE DIGITAL AGE

I.1. The emergence of the modern teenager

The first generation with all necessary means in achieving the status of a modern teenager at their disposal was the baby-boom generation. To be able to achieve it only through trivialities – which are desirable, easy and enjoyable – the teenagers of the 1960s needed their own culture. It had to be different from that of their parents, in order to strengthen their sense of independence, autonomy and affirmation, both in relation to previous generations and in relation to peers from their own generation.

The emergence of modern teenagers coincides with that of the hippie movement. This *flower-power* revolt of adolescents and youth could not have reached such heights in the absence of information technology, namely the radio, through which the phenomenon was primarily proliferated.

I.2. Technological advance in the digital age

Especially since the 1960s a range of communication technologies have been developed, as well as a wide range of household appliances, making it easier to invest the time required for domestic tasks in other areas of activity. This relationship between time availability and technological progress is evidenced by the emergence of the above-mentioned movements. This age was practically the pre-digital age, the *analogous* one, which will pave the path of the digital age, which will give rise to unpredictable phenomena like "accelerated change" (see Prensky, 2014).

According to Kurzweil's singularity theory, technological progress has been in a state of accelerated change since the 20th century, exhibiting an exponential growth (Moravec, 2004; Kurzweil, 2005). From individual to mass communication, from press to news bulletins, from novels to movies, from novel to serial, from physical testing to computer simulation, from stencils to print, the list can go on, from all vantage points in all areas of human activity, these transitions make up the very definition of the digital age: a transition from existence to quasi-existence and from reality to virtual reality.

I.3. The generation gap

The reason why it is necessary to review the sequence of events, changes, and technological advancements that have shaped modern society is to identify the sources of the ever-increasing generation gap. Behaviors, attitudes, but especially specific and fundamentally different values between generations have emerged, and for the first time in history no less than four generations (UN, 2012) are living together and working together.

Two of the theories that explain these intergenerational conflicts are highlighted to be particularly comprehensive, studying the issue at a level of generalization that gives the possibility of flexible yet accurate interpretations, in accordance to geographic regions: Howe-Strauss' generational theory (1997) and Prensky's Digital citizenship (2001). While Howe and Strauss identify the existence of a cyclic pattern of four generational archetypes, Mark Prensky adds a new perspective, dividing current generations into digital immigrants and natives.

The four archetypes identified by Howe and Strauss are:

- *Prophets* – idealists, awakening promoters, now represented by the baby-boomers;

- *Nomads*, children of prophets – reactive, resilient and individualistic, represented by generation X;

- *Heroes*, children of nomads – civic and optimistic, represented by the Millenials;

- *Artists*, children of heroes – adaptive conformists, now represented by generation Z.

Accelerated change, globalization and multiculturality are being added now to the above-mentioned fundamental differences, which alter relations and even tend to amplify the incompatibilities highlighted by the archetypal characterization described above. These phenomena create discomfort for previous generations which are forced to adapt, while for generation Z or even millennials in some geographic regions, they represent the norm, being present during their development.

I.4. Digital citizenship

The second theory, reflecting on the intergenerational conflict is digital citizenship, separating global population in *digital immigrants* and *natives* (see Prensky, 2001).

Generation X – or rather the millennials in Romania – will be the first "native speakers of the digital language of computers, video games and internet" (Prensky, 2001, p. 1), thus being the first generation of digital natives.

The differences between the two categories are being particularly felt in education. Not only are generations of prophets and nomads trying to educate generations of heroes and artists, but now they also come from different worlds: most educators from the pre-digital one and most learners from the digital one.

Digital Natives tend "not to trust anyone" (Thomas, 2012). Under these circumstances, it is not surprising that when we overlap the image of a non-performing and corrupt education, which – for better or worse – is so much promoted in public space over the digital native's mantras, namely: "respect is gained regardless of status" and "competence is proven or tested"(Ekins, 2014), we find digital natives being rather cynical of education.

CHAPTER II – FORMAL EDUCATION IN THE DIGITAL AGE

II.1. Conceptual redefinitions

The established form of formal education's definition captures the characteristics of the framework in which this type of education takes place: within a hierarchical structure, chronologically graduated in cycles, designed to achieve predetermined purposes, etc., i.e. formal education, or in more popular terms, school. The fundamental change of semantics for the term is astonishing: from expressing ease and recreation – the Greek skole – to expressing guided and targeted productivity, namely work and effort.

We find that educators approach the educational process idealistically, teach a curriculum mainly deriving from pragmatic doctrines, use traditional school methods, yet somehow expecting to form and develop 21st century skills – deriving from objectivism, postmodernism and 21st century pedagogy. Under these circumstances the failure of Romania's education system to produce future informed citizens, or at least citizens

possessing the skills which would enable them to inform themselves, in an age where information is an absolute necessity, is understandable.

II.2. The functionality of traditional Romanian education in the digital age

We will deal with the applicability of the ideals expressed by the law, through Art. 2 of the Law of National Education, starting from the assumption that the educational effort is centered in such way as to comply with the norms and regulations in force, and the course of formal education and pedagogical practice coincides with that of the legislation.

II.2.1. Value-oriented education

Values are developed by associating circumstantial action/inaction with its desirable/undesirable result. Acquiring values results in their transformation into sets of desirable behaviors and attitudes.

The predominant, tacitly promoted attitude, by implicit learning means within the school is obedience. Given that "authority is a fundamental necessity of any community" (Milgram, 1963, p. 371), and in the case of education the authority is represented by the teacher, the pupil must relate to it in order to assimilate the set of rules according to which he will adjust his conduct in school. Since the basis of authority in this case is not charisma or leadership skill, authority must be enforced through punitive means. "In schools it reads: *A good child does not speak unasked*. The child is thus forced to replace his need to ask with the act of obedience" (Marcus, 2014).

In addition to obedience, school experience tends to form other undesirable attitudes, as well. For example: generalized dissimulating behavior – a good pupil in school can be a delinquent outside of it – opportunism – grades hunters – superficiality – exploiting school or teacher grading systems or assessment patterns to get better grades. But these vices of the formal education system are well-known and should not require additional argumentation.

II.2.2. Education oriented towards creativity, cognitive and voluntary capacity

The fact that education is not oriented towards activities aimed at favoring the process of "creating useful products or novelties" (Mumford, 2003, p. 110) is self-evident and we consider that it does not require any argumentation. "In learning, especially for children and adolescents, for certain knowledge to be memorized and returned correctly at the examiner's request without being understood is commonplace" (Marcus, 2013).

But not only is the stimulation of creativity missed by education. Given that, according to the European Commission's report in 2015, 37% of students aged 15 are functionally illiterate (ETM Romania, 2015, p. 4), can cognitive capacities be considered adequately addressed?

The issue of orienting towards the development of the volitional capacities implies, on the one hand, aspects of pure voluntary (unconstrained) action and, on the other, the education or development of perseverance and/or "will" to start and finish certain activities. In this respect, the school is clearly oriented towards the education and development of perseverance founded in obedience, which in turn is based on extrinsic motivation stimulated coercively, namely through penalizing means.

II.2.3. Forming the mental infrastructure of society

While school claims to possess the "true values and true knowledge" – otherwise self-attributed, similar to the church – they sooner or later prove to be doubtfully useful if compared against social experience, especially when one is faced with the devaluation or sometimes downright ridicule of school performance, lack of socio-professional and implicitly economic rewards as well as the discrepancy between what school pretends to form and what it actually forms.

Given that the discrepancy between the demand of society and the education offer is apparently on the rise, it is difficult to argue in what way educators form the learner "in accordance with the new requirements deriving from the status of Romania as a member of the European Union and from the functioning in the context of globalization and the sustainable generation of a highly competitive national human resource able to function effectively in today's and future society "(LEN, 2011, Art. 2 (2)). As for the "future society," "almost all literature in the field finds things so complex and risky at the moment that the only predictability is major and chaotic change." (Gee, 2016, p. 6).

II.2.4. Free, complete and harmonious development of human individuality

Harmonious development implies adequate and balanced stimulation of physical and cognitive components, aesthetic taste and understanding of the social, economic and political environment, etc., in meaningful ways. The emphasis, however, falls mainly on cognitive development – more specifically, of memory – something that has been observed through predominant orientation towards the acquisition of content from scientific or epistemological disciplines, to the detriment of sports or artistic activities for instance.

In such conditions, inconsistencies of criteria for evaluating the individual arise from education in conjunction to society, despite the consistency in the apparent orientation of both systems in the same direction, which guarantees the failure of their cohesion. And if schools cease being the predictors of successful integration in the society, formal education ultimately loses its purpose.

II.2.5. Promoting the assumption of a value system by the learner

Beyond the fact that morality is constructed in stages of development, closely related to cognition and underlying character traits (see Kohlberg, 1971), the notions of "good", "desirable" and "important" are as dynamic as society's values. And in the context of accelerated change, these values tend to change quite often.

If education promotes certain behavioral attitudes that will materialize tacitly in values during development, they compete with another set of values promoted in a similar manner by society, despite the stated intention of both education and society to promote noble values. Like in the case of many systems and institutions, social groups and individuals; the stated attitude and the manifested one are often considerably different if not even diametrically opposed. And under these conditions, the school becomes again the competitor of the society to which the graduate will have to adapt to.

II.3. 21st Century skills

21st century skills relate to a set of skills identified to be necessary for the proper interpretation of the social role of citizen and four of them seem to be essential to success in modern society: critical thinking/analysis, problem solving, communication and collaboration; and Creativity and innovation. Political and economic leaders, the business community and civil society are increasingly asking schools to focus their formative efforts on their development (Pellegrino, 2013).

II.3.1. Critical thinking/analysis

Critical thinking is one of the main 21st century skills, being comprised of a wide range of analytical skills, from interpretation of information to argumentation skills, assumptions, inferences, etc. In addition, it also implies a significant cognitive component that provides the necessary information infrastructure as a framework, context for the competence to develop in. Being a competence, an attitude component is also present, correct interpretation of

information imply a certain amount of cynicism as well as honesty with regard to the line of argumentation, meticulousness, patience, etc.

II.3.2. Problem-solving

Problem solving is an essential competence of today's existence. Given that its definition would be redundant, we will analyze the process by which solutions are identified for the encountered problems, according to Zelazo-Carter-Reznick-Frye (1997), based on the theory proposed by Simon and Newell (1971).

The authors identify four essential steps in the problem-solving process:

1. Problem representation – a stage in which the problem is processed and semantically integrated to be represented in the cognitive space;

2. Planning a solution – a stage in which a selection of available strategies is made, by calling on previous experiences, theoretical knowledge or similar situations;

3. Keeping the strategies in working memory – once hierarchically organized, the available strategies will be used in accordance with the set of limitative rules of each strategy;

4. Evaluation of results, identification and correction of errors – a stage in which not only the outcome is evaluated and errors are corrected, but also the reasons why those errors have occurred are re-evaluated as well as the effectiveness of the strategies and/or the algorithm of their use for improving performance in future similar or related situations.

A vast empirical inventory consisting of simple and complex patterns alike, associated with the development of a fluency in their proper use and recombination seems to be the guarantor of a solid problem-solving competence.

II.3.3. Communication and collaboration

In most of its instances, communication today is fundamentally different from what it was two decades ago, its indirect forms being the way we communicate the most. However, communication in the 21st century is not limited to messages, comments on social networks or telephone conversations. It also contains a huge palette of media through which broadcasters can send out their message. And so the success of communication is commensurate with the broadcaster's ability to turn the message into media content.

Collaboration involves "verbal and socio-emotional interactions, through which different intellectual and social competences transferable in different contexts, are developed" (Bocos, 2002, p. 212) and collaborative learning "creates the premises for constituting a real learning community [...] in which the environment is of a constructive, trustworthy and mutual assistance nature; learners feel respected, valorized and useful thus gaining confidence in their own forces, since they all participate in the decision-making process; The members are aware that group performances are due to their individual contributions and vice versa and that individual performances can only be highlighted if the performance of the group as a whole is good" (Ionescu, 2003, p. 221).

II.3.4. Creativity and innovation

While the definition of creativity is simply the ability to produce something new, or "a process involving the creation of useful novelties or products" (Mumford, 2003, p. 110), the definition of innovation is in turn "a new idea, product or method" (Frankelius, 2009).

In the context of 21st century skills, innovation is the result of a creative process, particularly aimed at improving existing products, enriching or diverting ideas, combining or recombining certain elements to produce novelty.

Stimulating creativity and thus implicitly the emergence of innovation can be accomplished through problem-solving and imaginative exercise. The solutions and speculations resulting from these scenarios can be partially operationalized and, for their operationalization, the learner becomes intrinsically motivated to independently research and thus develop his/hers creative potential.

CHAPTER III – THE FORMATIVE VALUE

OF SPONTANEOUS MEDIA INTAKE

III.1. Media intake

According to the proposed definition, media intake is *the totality of information assimilated voluntarily or involuntarily by the individual as a result of or during exposure to media*.

Involuntary media intake reflects that segment of media intake manifested in the absence of explicit and voluntary action, and may be considered to some extent polluting. In any case, this type of media intake by nature does not represent the consumer's active and conscious interests, following a free selection of material.

On the other hand, voluntary media intake is conscious, voluntary and, in most cases, an intrinsically motivated intake of freely selected media. In order for the activity to be considered voluntary, it must reflect the interests or preferences of the consumer and the activity should be the result of explicit internal decision.

III.2. Digital literacy

The term *literacy* includes the set of skills and informational acquisitions necessary to understand and be able work with the specific language of a semiotic domain without which one cannot communicate or understand what is communicated adequately. Note that literacy involves not only understanding the signs and symbols of the language itself, but rather, an understanding of – at least – the basic concepts that the field is based on and/or under which it functions.

The antonym of the term will be that of *i-literacy* – under the same rules other terms using the prefix "i" (eg licit-/i-llicit) are formed, since aliteracy has an entirely different meaning, according to the Romanian Explicative Dictionary – DEX (2009). The contexts this term may be used in and its versatility in forms or argumentative construction must be close to or – preferably – identical to the use of the term "literacy" in English.

Since digital natives are inherently familiar with how information is organized in digital media, how digital systems operate and possess the required knowledge needed to use digital tools, demonstrating superior performance in the exploration and investigation of information

when compared to most digital immigrants, they can be considered inherently digitally literate, at least at a basic level (Teo, 2015).

III.3. Digital games

We will define the digital games as: *complex electronic games that inherently involve an activity aimed at achieving goals and obtaining rewards or feedback as a result of problem solving in immersive simulated environments, interacting with the user by virtue of defining options of the simulation parameters, whose manipulation results in sequential observable effects.*

Perhaps more than their classification, their composition is more important in identifying their formative values. A digital game is thus delimited by four fundamental aspects:

- *Content* – similar to motion picture, the content of digital games ranges according to theme;
- *Interaction dynamics* – The dynamism of interactions imposed by the consumer experience, with the potential to determine the level of user input skills required for a satisfactory experience;
- *Projective identity* – The form in which the user is projected into his/her identity in the game space, implicitly determining the modalities or possibilities of interaction;
- *Functional modal design* – The extent to which the game, by its design nature, requires and is functional in its entirety with a single user, multiple users, (multi-player), or a large population of users interacting in the same instance (MMOG - massively multiplayer, online game).

It is important to note that many digital games transcend various types of content, levels of interaction dynamics, or identity design forms.

III.4. Affinity spaces

The term of *affinity space* was first defined by author James Paul Gee (2005) as a more specific and appropriate alternative to the context of video games and media consumption resulting in the expression of *communities of practice*.

Unlike *communities of practice, affinity spaces* are less restrictive: they do not assume belonging or membership in the community. In other words, while community practices are a space dedicated to the community and its members, the affinity space is a space dedicated to the affinity, which means various communities of practice can be part of, or formed within it.

The modalities of participatory organization and effort are completely different in affinity spaces compared to school, which is in fact a community of practice. While schools operate according to Bell's curve, affinity spaces operate according to the Pareto Principle or rule of 80/20 (Shirky, 2008). According to this principle, 80% of users in the affinity space produce 20% of the content and 20% produce 80% of the content.

III.5. The formative value of digital games

III.5.1. Empirical evidence of the formative facets of digital games

Several studies have demonstrated the formative potential of digital games:

- Development of notional and conceptual thinking (vezi: Barab și colab., 2007; Klopfer, Scheintaub, Huang, Wendel, Roque, 2009);
- Processual abilities and skills (vezi: Kafai, Quintero, Feldon, 2010);
- Epistemological understanding (vezi: Squire & Klopfer, 2007);
- Development of identity and participatory attitudes (vezi: Barab și colab., 2007; Dieterle, 2009).

These results should not be surprising. Digital games are inherently complex problem-solving environments based on continuous learning, offering paths to perfection through entertainment and pleasure (Gee, 2009). By their structure and design they have the potential of ensuring "effective learning" (see Bransford, Brown, Cocking 2000; Gee 2005).

III.5.2. Fundamental formative principles of digital games

James Paul Gee (2001) identifies 36 principles according to which digital games work and which have the potential of turning them into "real learning engines" (Gee, 2003).

Among these, we mention co-design principle – which allows the environment to be altered by the user, in ways similar to reality; The commitment principle – which creates the premises for the emergence of intrinsic motivation to engage in various activities; The identity principle – regarding the identity assumed and projected by the user over the character or entity he/she interprets; The performance principle, Continuous learning and Heuristics principles – considering the exploratory and progressive nature of the game within a complex simulated environment, etc.

The essence of the formative potential of digital games is the graceful blending of identity, learning as process, and recreation or entertainment. Identity as an anchor of reality assuring the projection of the personality of the user in its entirety and thus implicitly making him responsible for the project of becoming his new identity; learning as a process of continuous development of this identity in so many and varied ways and at so many levels; and recreation or entertainment as a motivational motor and energy provider in support of the learning effort; exploring, discovering, confirming hypotheses, solving problems and success, are all elements that make up the entertainment component of games, while all of it is in fact learning. And learning is in itself fun as long as it has meaning, perceived utility and is intrinsically motivated.

III.6. Conclusions

Considering the learning ways of digital natives, predominantly centered around and sustained by new media – something they are familiar with, it is the duty of formal education to channel its intake into a desirable area with consistent guidelines in accordance to the ideals of society and within the limits of what tomorrow's society will consider useful, good, fair, normal or commendable.

CHAPTER IV – RESEARCH DESIGN

IV.1. The goal and objectives of the research

IV.1.1. Research goal:

The generalization of the formative intervention program developed and applied in the current research, in a conceptual model of formative intervention, implementable by the teachers, usable for the development of a wide range of competencies without increasing the perceived workload of the students.

IV.1.2. Research objectives:

Through this research we aimed at developing a formative intervention program that can channel or significantly influence spontaneous media intake in a manner designed to stimulate the development of critical thinking and digital literacy.

O1. Determining the critical thinking level of targeted population;

O2. Determining the digital literacy level of targeted population;

O3. Identifying the relationships and their dynamics between the levels of critical thinking and digital literacy in relation to various characteristics of the studied population: age, gender, schooling institution, study year and profile;

O4. Identifying patterns of media intake of the targeted population;

O5. Identifying connections and their dynamics between critical thinking and digital literacy levels, depending on the observed media intake patterns;

O6. Testing the effectiveness of the developed formative intervention program;

O7. Proposing the use of the intervention program in formal high school education;

O8. Proposing the development of other formative intervention programs based on the provided conceptual model, in order to validate its construct.

IV.1.3. Research questions:

1. Does high-school level formal education successfully develop critical thinking or digital literacy?

2. To what extent, the amount of media consumed influences critical thinking or digital literacy levels?

3. To what extent and in what way do media intake patterns influence critical thinking or digital literacy levels?

4. What are the media intake means for the studied population?

5. What types of media are preferred by the studied population?

6. Can a formative intervention program based on channeling spontaneous media intake in formative ways, thus supporting the efforts of formal education be successful?

IV.2. Research hypotheses

General hypothesis: The channeling of spontaneous media intake through the formative intervention program contributes significantly to the development of critical thinking and digital literacy of the targeted school population.

Specific hypotheses:

1. Critical thinking or digital literacy test scores are not influenced by gender, age, schooling institution, study year or profile of the participant.

2. Critical thinking or digital literacy test scores are not influenced by the time spent watching television or on digital platforms, but are influenced by the time spent playing digital games.

3. Critical thinking or digital literacy test scores fluctuate according to media intake patterns.

4. The statistical relations and their dynamics between the types of media consumed, the time invested in its intake and the motivation for its intake reveal consumer archetypes.

5. The formative intervention program is a constant predictor of the development of critical thinking and digital literacy.

IV.3. Research stages

The research was structures in six stages:

IV.3.1. Literature study stage to develop required tools

The purpose of this first stage was to identify models in the assessment of the competences concerned, which would at least partially ensure the consistency of the instruments to be developed.

IV.3.2. Tools development stage

During this stage, the following tools were developed: initial media intake questionnaire; the formative program questionnaire; critical thinking test and digital literacy test.

IV.3.3. Test piloting stage

In this stage the developed teste were piloted, according to research design.

IV.3.4. Pre-experimental stage

During this stage three phases are being distinguished: initial testing phase – serving as an initial assessment; investigative statistical investigation phase – required in order to investigate the necessary directions in the elaboration of the formative intervention program, and the qualitative-confirmatory investigation phase – used to qualitatively investigate observed statistical relations from the previous phase.

IV.3.5. Experimental stage

This this stage too is comprised of two phases: the consultative phase – in which pupils were consulted on the form in which they prefer to have the formative intervention program developed and the formative intervention phase, respectively the phase in which the implementation of the intervention program itself took place.

IV.3.6. Post-experimental stage

In this stage, we applied both a questionnaire on the perceptions regarding the implemented formative program, and the two tests – critical thinking and digital literacy – for a second time, which served as final assessment.

IV.4. Population and sampling

IV.4.1. Representativeness

The study was conducted on a population of 271 high school students, i.e. grades X-XII. This sample is representative for a population of 647,000 – which in 2016 (INS, 2016) represented the high school students population nationwise – at an error rate of 5.95% and a confidence level of 95%.

IV.4.2. Sampling

The experimental group consisted of 137 participants, while the control group accounted for 134 participants. In the four focus groups conducted a total of 41 pupils took part, 9 to 13 participants per session respectively. Participants in the focus groups were of both sexes: 22 female and 19 male.

IV.5. Variables:

Subject variables fall under two categories:

- Descriptive, representing characteristics of the studied population such as age, gender, schooling institution, study year and profile;
- Variables representing media intake indices, quantitatively and qualitatively – referring to the type of preferred or consumed media – as well as motivational.

Independent variables relate to parameters of the formative intervention program, such as participation in it and the percentage of content browsed.

Dependent variables reflect the critical thinking and digital literacy test scores within the two instances of testing.

IV.6. Tools

IV.6.1. Initial media intake questionnaire

This questionnaire was designed to collect data on the amount, type of media, and motivation for the media intake. Resulting data were statistically processed during the investigative statistical investigation phase.

IV.6.2. The formative program questionnaire

This questionnaire collected data on the perceptions of participants in relation to various aspects of the implemented formative program.

IV.6.3. Critical thinking test

The critical thinking test was developed according to Watson-Glaser's critical thinking assessment model (see Watson, 1980; Wilson, Wagner, 1981; Hassan, Madhum, 2007) and consists of five sub-scales: *inferences, assumptions, deductions, interpretation of information* and *analysis of arguments*.

IV.6.4. Digital literacy test

In the absence of any available assessment models, the digital literacy test was developed on the basis of the four areas of competence that make up digital literacy according to the European Commission's classification (see ec.europa.eu, 2005, 2016; Vicente, López, 2011; Martin , 2005): *information, communication, content creation* and *problem solving*.

IV.6.5. Test battery design:

Both length and design of the test battery had to be adjusted in a manner that would allow the whole battery to be applied during a single course session of 50 minutes. Thus, in the first instance, the test battery consisted of the media intake questionnaire and the two tests. As for the second instance, the media intake questionnaire was replaced with the formative program questionnaire.

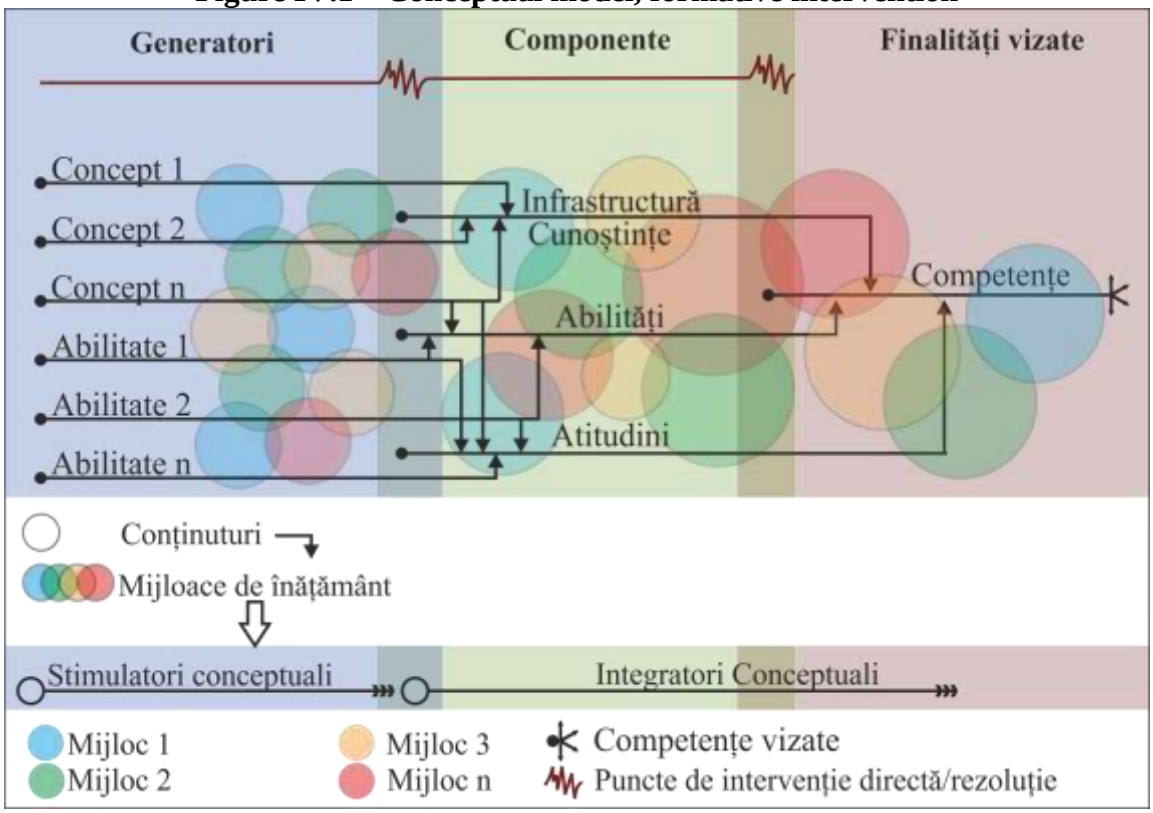
IV.7. The formative intervention program

IV.7.1. The conceptual model of the program

The conceptual model of the proposed formative intervention contains the following elements (Figure IV.1.):

- *Cognitive level*: generators – concepts and isolated abilities – components of concerned competences – targeted goals, namely full competences.
- *Types of content*: conceptual stressors, conceptual integrators
- *Dynamics elements*: cognitive dissonance accumulation points/resolutive intervention points.

Figure IV.1 – Conceptual model, formative intervention

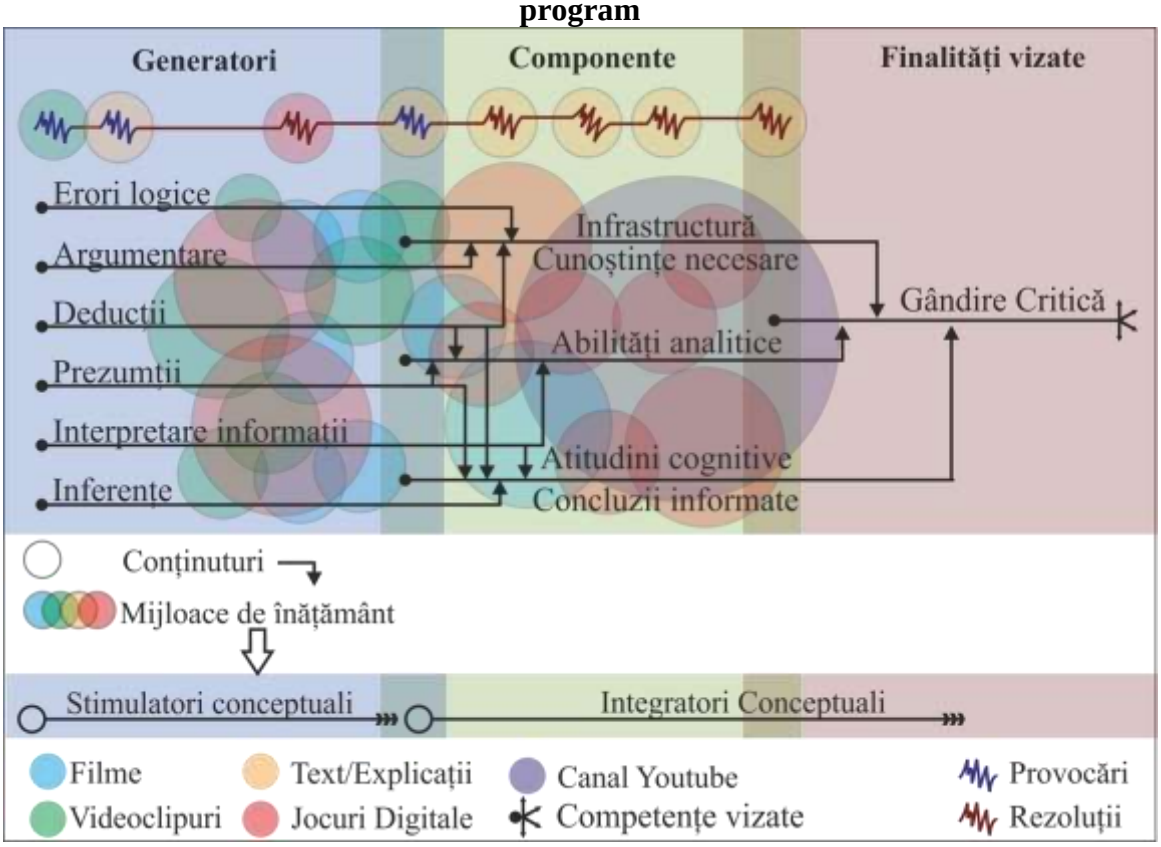


The design of the formative intervention according to this model, comprises 9 stages, namely: Definition of concerned competency/competences; Identification of its structure; Identification and selection of generators – elements that make up an ability, attitude or specific knowledge; Content identification; Content selection; Content distribution within the program; Providing initial problematisation; Ensuring the accumulation of cognitive dissonance and direct intervention/resolution strategies.

IV.7.2. The implemented formative intervention program

The experimentally implemented intervention (Figure IV.2) was structured on the basis of the conceptual model presented above. It aimed to develop critical thinking and digital literacy through the intake of multimedia materials posted or recommended in a dedicated online group. The direct intervention of the educator in the intervention was limited to posting challenges concerning various media and resolutions – comments meant to clarify the reasons why certain materials were posted or recommended.

Figure IV.2 – Schematic representation of the implemented formative intervention program



The formative intervention program spanned over 12 weeks and its implementation started in the third week of the first semester of the school year of 2016-2017.

IV.8. Challenges and limitations of the study:

The biggest challenge turned out to be the target population. Studying high school students, considering both their legal status – some of the participants being minors, and the institutional framework in which the study was conducted, has created a number of difficulties and limitations, both administrative and logistic.

CHAPTER V – RESEARCH OUTCOMES AND INTERPRETATION OF RESULTS

V.1. Population and sampling

V.1.1. Targeted population

The studied population was formed exclusively by high school students from four Arad national colleges, grades X-XII, of both sexes, aged 16-18 years. The distribution of participants on the basis of gender, age and schooling institution was relatively homogeneous, except for the study profile.

V.1.2. Sampling

The distribution was carried out through a self-selection process, depending on the participation within the formative intervention program. Accordingly, the population divided into two groups, respectively the experimental one – represented by the population that participated in the formative intervention program, in a proportion of 49%, and the control group – represented by the population that did not participate in the program, in a proportion of 50%.

V.2. Tools

In order to verify the validity of the scales used fidelity analysis for critical thinking and digital literacy tests were performed. Both tests indicated a normal distribution, according to Bell's curve.

V.2.1. Critical thinking test

For the Critical Thinking Test, the value for Alpha-Cronbach was 0.67. Although below the threshold ($\alpha \leq 0{,}70$), values higher than 0.66 are admitted for experimental measurement especially if the inter-item correlation matrix indicates values between 0,2 and 0,4.

V.2.2. Digital literacy test

In the case of the digital literacy test, the Alpha-Cronbach score was 0.71, indicating a solid construction.

V.3. Hypotheses testing

V.3.1. First hypothesis

The hypothesis according to which *critical thinking or digital literacy test scores are not influenced by gender, age, schooling institution, study year or profile of the participant* was partially confirmed, with significant differences in test scores in relation to profile, schooling institution, and gender, for digital literacy.

As a result of the qualitative analysis of the registered differences there was a slight defect in the distribution of the profiles within the schooling institutions, only one of the high schools in which the study was conducted including a technical profile. However, the differences between the schooling institutions in relation with critical thinking test scores did not exceed 5%, in contrast to the differences in digital literacy test scores, which were 15%.

However, the specifics of the quality of education did not appear to be responsible for the fluctuation of the scores, these being rather influenced by the socio-economic situation of the pupils in the respective schooling institutions.

The level of digital literacy was lower by 15% for female participants, mainly due to the low incidence of digital gaming which is associated with the development of digital literacy.

V.3.2. Second hypothesis

The hypothesis according to which *critical thinking or digital literacy test scores are not influenced by the time spent watching television or on digital platforms, but are influenced by the time spent playing digital games* has also been partially confirmed, significant correlations being indicated between digital gaming and digital literacy.

While there was no significant relationship in relation to critical thinking, an inverse-proportional relationship between time spent in front of the television and digital literacy emerged for participants exceeding 3 hours of consumption,. In the case of digital games, however, another dynamic relationship highlights the optimal gaming time for the development of digital literacy, respectively, between 3 and 5 hours a day. The averages are related to weekly intake, including holiday and vacation times.

This result does not surprise, given the increased intake of television material by female participants compared to male. Another factor is the allocation of intake in the sphere of

televised materials at the expense of gaming and digital platforms, which have the potential to develop digital literacy.

V.3.3. Third hypothesis

The hypothesis according to which *critical thinking or digital literacy test scores fluctuate according to media intake patterns* has been confirmed, with multiple patterns of intake being identified, acting as predictors for increase in scores in both critical thinking and digital literacy.

Thus, RPG (role-play game) gamers scored 6% higher on the digital literacy test, and simulator-game players scored 2% higher on critical thinking. Two other patterns formed by association of three intake factors were responsible for 5% increase in critical thinking test scores and 9% for digital literacy.

The results obtained supports the assumption based on which intake patterns are formed in accordance to preferences and affinities. Given that some consumers are prone to certain types of media such as educational or those implying complex themes, the incidental development of critical thinking or digital literacy is obvious.

V.3.4. Fourth hypothesis

The hypothesis according to which *the statistical relations and their dynamics between the types of media consumed, the time invested in its intake and the motivation for its intake reveal consumer archetypes* has been confirmed. There were several relationships between preferred types of media which indicate affinities.

The archetypes highlighted in the analysis necessary to address this hypothesis supported the elaboration and adjustment of the formative intervention program according to the consumer preferences of the various identified categories. These consumer archetypes were obtained by analyzing media intake trends which by association formed distinct patterns.

The most remarkable archetype was that of sports consumers, who are loyal to their affinity across platforms, playing digital sports-themed games and watching sports both on TV and on digital platforms. In the case of other archetypes, affinity tends to transit, as in the archetype of cultural consumers, who in the online environment consume predominantly educational materials, preferring televised media when it comes to cultural content.

V.3.5. Fifth hypothesis

The hypothesis according to which, t*he formative intervention program is a constant predictor of the development of critical thinking and digital literacy was* partially confirmed, in the sense that while the intervention program is a predictor for the development of both critical thinking and digital literacy, the prediction is not constant but dynamic.

The results obtained reveal a dynamic relationship between the quantity of the media consumed and the test results. The quantity consumed by the majority of participants from the total number of posted and recommended materials was around 30%. However, given that each media had multiple alternatives targeting the same concepts, this share was predictable. Thus, it is also revealed that repeated exposure through intake of media not in accordance with preference does not increase efficiency, even if aimed at the same concepts, and iteration in this particular approach renders no beneficial result.

The efficiency of the intervention program's design is emphasized even more by the fact that consuming 35% of the recommended media also provided the highest increase in test scores. On average, they were 18% higher for critical thinking and 5% higher for digital literacy. The low increase in digital literacy is the result of more than 77% of participants refusing to leave their media intake comfort zone, mainly in relation to digital games, virtually the only type of media contained within the intervention to directly address its development.

However, for 16% of program participants, the program cannot be considered successful, since they felt that the program is *taking away from their free time*. And as the program was meant to channel spontaneous media intake, the first condition is the lack of perceived effort. Otherwise, the program fails, becoming just another formative alternative, based on media intake and felt as such by the educator, thus losing its purpose.

CHAPTER VI – CONCLUSIONS, SUGGESTIONS AND RECOMMENDATIONS

VI.1. Conclusions

The general hypothesis, according to which *the channeling of spontaneous media intake through the formative intervention program contributes significantly to the development of critical thinking and digital literacy of the targeted school population,* has been confirmed, thus the objective of *testing the efficiency of the intervention program* being also achieved, and from this perspective it is necessary to define what we mean by the term *efficiency*.

By efficiency, with regards to the formative intervention program we do not refer to the quantitative increase in relation to the time allocated towards development, especially since the time allocated according to such a conceptual definition would translate preponderantly into effort. In the current context, time invested in the activity is not, or should not, be perceived by the learner as an effort no more than watching a movie or playing a digital game should. According to this line of argumentation, effortless time investment can no longer be considered investment – of course, unless we assume a competition of this activity with other, more effective formative ones, according to the classical definition.

Research results highlighted that the developed formative intervention has the potential to improve the quality of formal high school education in a manner that does not interfere with the formal education process, having developed to a statistically significant extent, both critical thinking and digital literacy with no perceived effort from the learner. The conceptual model of formative intervention provides possibilities for elaborating specific interventions, targeting different competences, either of specific disciplines or of entire fields of knowledge or areas of development.

VI.2. Suggestions and recommendations

We consider the validation of the conceptual model of formative intervention as the first priority, since it is a process that requires time, application and study in several instances, of the efficiency of interventions elaborated based on it, in different fields of activity, curricular areas or disciplines, schools and populations, as well as in different geographic regions.

It is also important to disseminate the model for improvement, and should it invalidate, avoid proliferation or the improvement of an inefficient model – there is quite enough effort invested in such endeavors as it is.

We consider extremely important for teachers to be made aware of the formative potential of media intake by disseminating information revealing the possibility of channeling it into a formative manner, its ability to generate and maintain curiosity about different areas of knowledge, or culture. The exploitation of new media in significant ways i.e. that can cover what other types of content using other means of communication cannot under the same efficiency regime, should be encouraged.

As long as the very purpose of educators and the educational act itself is to form and educate, this must not come second to the educational institution, being its duty and responsibility, to exploit all available means to achieve it.

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