

MIND, BRAIN AND MEDIA EDUCATION.

A RESEARCH PROJECT ON CARTOONS WITH TEACHERS AND UNIVERSITY STUDENTS

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ABSTRACT

The paper proposes a reflection on the educational dimension of cartoons from the double point of view of Media Education and Neuroeducation. Cartoons are either a means to highlight the educational potential of the fictional fruition practice and an activator memory, attention, emotion and perception which are at the basis of cognition and learning. This contribution describes an education research carried out in the A.Y. 2015/2016 with 12 in-service teachers and 198 university students attending the course of Primary Education Sciences at the University of Palermo. They both experienced a media education training methodology mediated by the use of cartoons.

KEYWORDS

Cartoons, media education, neuroeducation, learning process, teaching research

SOMMARIO

Il lavoro propone una riflessione sulla dimensione educativa dei cartoni dal duplice punto di vista della *Media Education* e della *Neuroeducation*. I cartoni costituiscono sia un mezzo per evidenziare il potenziale educativo della finzione

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sia un attivatore di memoria, attenzione, emozione, percezione, elementi chiave della cognizione e dell'apprendimento. Il contributo descrive una ricerca educativa svolta nell'A.A. 2015/2016 con 12 insegnanti in servizio e 198 studenti universitari del CdL in Scienze della formazione primaria dell'Università di Palermo. Entrambi hanno sperimentato una metodologia formativa mediata dall'utilizzo di cartoni.

PAROLE CHIAVE

Cartoni, media education, neuroeducazione, processo di apprendimento, ricerca didattica

1 Introduction

In the last decade training through competencies has become one of the essential elements at all levels of education. Competencies are today the backbone of educational planning and action, from the outset through to universities and in ongoing education or workers and areas of non-formal education.

Attempting to support cartoons for education and learning purposes has prompted considerable attention over the last years. The great variety of cartoons available has provided much for educators and researchers to explore, resulting in intense disputes that many cartoons have benefits both in and out of the classroom for learners of primary school. Many cartoons have been revealed as strong educational tools for their design as well as their effective implementation in the classroom. Thus far, research on the impact and outcomes of this pedagogy is somewhat limited, but promising. Cartoons are being increasingly used in initiatives to promote personal empowerment and social inclusion and are object of increasing research.

Cartoons are one of the most effective means of communication we have. Media ownership, production and distribution have become increasingly internationalized and even globalized. But educational responses have not kept pace with these developments. There has been much rhetoric, but little research about Media teaching and learning. There is, therefore, a pressing need for comparative studies, so that local research can be examined in a global context.

In the evolving multimedia environment, media literacy is arguably more important than ever. Cultural studies and critical pedagogy have begun to teach us to recognize the ubiquity of media culture in contemporary society, the growing trends towards multicultural education, and the need for media literacy that addresses the issue of multicultural and social difference.² There is expanding recognition that media representations help construct our images and understanding of the world and that education must meet the dual challenges of teaching media literacy in a multicultural society and sensitizing students and the public to the inequities and injustices of a society based on gender, race, and class inequalities and discrimination. Recent critical studies see the role of mainstream media in

² For examples of analyses of media literacy and pedagogy see Cortes (2000), Fleming (1993), Giroux (1994, 1997), Giroux & McLaren (1994), Giroux & Shannon (1997), Goodman (2003), Kellner & Ryan (1988), Luke (1994; 1997), Masterman (1985/2001), McLaren, Hammer, Sholle & Reilly (1995), Potter (2001), Semali & Watts Pailliotet (1999), Schwoch, White & Reilly (1992), Sholle & Densky (1994). See also the work of Barry Duncan and the Canadian Association for Media Literacy (<http://www.nald.ca/province/que/litcent/media.htm>) and the Los Angeles based Center for Media Literacy (www.medialit.org). It is a scandal that there are not more efforts to promote media literacy throughout the school system from K to 12 and into the university. Perhaps the ubiquity of computer and multimedia culture will awaken educators and citizens to the importance of developing media literacy to create individuals empowered to intelligently access, read, interpret, and criticize contemporary media and cyberculture.

exacerbating or diminishing these inequalities and the ways that media education and the production of alternative media can help create a healthy multiculturalism of diversity and more robust democracy. They confront some of the most serious difficulties and problems that currently face us as educators and citizens.

Considering the way teachers live in the new multimedia world and the way they see this world in relation to their personal philosophies of teaching, some questions arise. Do current formal curricula encourage engagement with new media technologies? Can we learn socially and academically valuable concepts and skills from cartoons? How can teachers and curriculum designers harness the participatory nature of digital media and cartoons?

The reflection contained in this contribution is proposed to analyse the use of television and computers to teach any subject, say Science, ICT, History, with the assumption that such technologies are not a neutral means of information delivery in Media education. They enable primary school children to interpret and make informed judgements as consumers of media; but they also enable them to become producers of media in their own right, and thereby to become more powerful participants in society. Cartoons education is about developing young people's critical and creative abilities.³

Moving from the recent Neuroeducation research, we infer that it is possible to consider cartoons as a tool for strengthening brain plasticity in respect of brain dominance, intellectual types and learning experiences. Neuroeducation may help outline the learning process underlying the use of cartoons starting from the neuro-mechanisms involved, such as memory, perception, attention, emotion. According to the neurophysiological profile, learning is to be associated with these aspects and cognitive development, as a whole, is subordinated to them. In this framework, a common thread between memory, perception, emotion, attention, and learning cognition may be represented precisely by the receptive visual/acoustic action itself which may accompany and support both the learning and the teaching process.

This paper describes the research for the development of competences in planning media education actions using cartoons during the Academic Year 2015/2016 with 12 in service pre-school teachers and 198 university students attending the degree course of Primary Education Sciences at the University of Palermo. The project involved students and teachers, for 40 hours, who experienced a media education training methodology for the promotion of competences in planning media education actions. We believe that the idea of learning through cartoons can improve the learning process, if TV and computer are developed to incorporate adequate pedagogical components, based on didactic principals as highly organized and properly guided pupils' activities. We follow this idea in

³ The educational process should be constantly improved to reach a higher level of children's perceived knowledge according to their potential. Different approaches, methodologies and teaching practices must be adopted and put into practice so that positive results can be achieved at the end.

this study, while trying to present research findings that support it. The learned skills and content through such learning activities can be successfully transferred outside of the cartoon environment with increased children's motivation.

2 Cartoons in education

We grow up with cartoons and become used to the way they function from an early age. This means that the cartoonist, or a manager using a cartoon to deliver a message, has a pre-primed audience. Cartoons can be used powerfully in advertising across many industries too.

Cartoons also have our childhood associations with humor, happiness and fun, and can serve to relax an audience in a potentially dull or tense meeting. They act as icebreakers, uniting your audience with humor and the pleasure of shared communication. Cartoons permeate our lives. Children encounter them in TV, mobile, computer. The essence of a cartoon is the reduction of something very complex to a few simple lines. In September 1960, in USA, a television show emerged from the mists of prehistoric time to take its place as the mother of all animated sitcoms. The Flintstones spawned dozens of imitations, just as, two decades later. The Simpsons sparked a renaissance of prime-time animation. The essays in this volume critically survey the landscape of television animation, from Bedrock to Springfield and beyond. The history of animation might be imagined in terms of three primary epochs: cinematic, televisual and digital. The essays in this paper deal primarily with televisual animation, with the notable exception of Alice Crawford's contribution, which directly addresses the impact of digital technologies on animation.

As several of the essays point out, however, there is a fair amount of overlap between the first two eras, both in the sense that most of early television's animation programming consisted of shorts originally created for the cinema and in the sense that the production of animation for the big screen, while greatly curtailed, did not cease with the 1948 Paramount Decision and the rise of television as a medium.

Cinematic animation constitutes a pre-history for the animation that was to emerge in a televisual context. Although cartoons exist in education research, it is usually in the form of children's work (Reid & Button, 1995), and while drawings as data are not uncommon, they are still often framed within quantitative conceptions of reliability and validity (Haney, Russell & Bebell, 2004).

Cartoons can be used for the analysis of social reality by means of visual language and an aphoristic and judgmental phrase (Caswell, 2004; Hempelmann & Samson, 2008; Powell & Paton, 1988). In the evolution of media into highly visual models, cartoons can be listed among the most significant forms of commentary (Edwards & Ware, 2005). They are also an important tool in assessing the reception of news in relation to the socio-cultural reality of a country (Dominguez & Mateu, 2013), and are beneficial for launching new metaphors

and popularizing new concepts (Bounegru & Forceville, 2011; Dominguez, 2014; El Refaie, 2003). According to McCormac et al. (2012), rather than presenting some data or facts, cartoons offer a means of delivering the theme in an entertaining, accessible, and reflective style that is more amenable to being embedded within the deep memories of readers. Similarly, according to Sani et al. (2012), cartoons are very effective media in setting society's agenda.

The reasons for creating cartoons to represent participants in a study are manifold. First, while ostensibly appearing playful, political cartoons are serious in intent. Similarly, the cartoons in this research emphasize important episodes in the lives of participants who share personal knowledge of their learning process. In doing so, they reveal an epistemological awareness that oftentimes significantly contrasts with traditional, institutional accounts. Second, because a strong visual component to written and/or auditory information is provided, a cartoon effectively conveys meaning(s) in a concentrated, highly economic manner, challenging the largely unquestioned hegemony of «words only» (Wolfe, 2001). Third, a bold, simple visual «text» represents information that invites (perhaps even challenges) the viewer to participate in the co-construction of meaning. Fourth, visual representations accommodate individuals who have difficulty in quickly processing large tracts of written text or dialogue. All four reasons interlock to provide multiple possibilities within the use of cartoons. Simply stated, I believe combining visual and narrative forms has multiple purposes, yet all purposes share the intent of creating a powerful impression for the reader or audience member.

Learning is based on the abstraction process performed through experience obtained from concrete materials (Egan, 1988). In this respect, cartoons, including abstract visual symbols, attract and maintain interest in a topic since they are abstract representatives of the reality (Orlich et al., 2001; Robb, 2003). In other words, learners enter the mental thinking process by means of visual elements in cartoons (Yaman, 2010). Cartoons help to teach events, facts, and objects in a simple and explanatory manner. Also, they provide observation and discussion possibilities to learners (Greenberg, 2002; Roesky & Kennepohl, 2008; Sewell, 2002), and develop their critical thinking skills (Chin & Teou, 2009; Hakam, 2009; Song et al., 2008). As another significant benefit, cartoons concretize teaching and raise motivation levels of learners (Cappuccio, 2012; Madden et al., 2008; Palacios & Gonzalez, 2005; Thomas, 2004).

Cartoons can clearly consume the attention of children. However, it is important to assess the extent that cartoons have an impact on childhood education (Cappuccio, 2014). It must be acknowledged that the activities of cartoon education require technological equipments, which don't have an exaggerated cost in themselves. However, they are not present in primary schools because they are badly considered.

In addition, these activities require a lot of time; which is difficult to fit in the organizational structure of school time and personal time, since these activities require specific expertise that most of the time teachers do not possess.

Media education can be configured as a strategic element in the education of a person as a whole. The application of the principles and objectives of media education in the field of video games is quite recent and there are many more open questions than established procedures, but they are very interesting. Buckingham (2003; 2013) and Jenkins (2006) believed Media Education is the process of teaching and learning about media and aims to develop both critical understanding and active participation. It enables young people to interpret and make informed judgements as consumers of media in their own right. Indeed, Media education is about developing young people's critical and creative abilities.

3 Neuroeducation & cartoons

The analysis of the receptive visual/acoustic practice connected to brain development may be included among the areas of investigation of Neuroeducation, according to which it is possible to focus on the neural mechanisms enhanced by videos or, in general visual programs. In the specific case of cartoons, it is possible to identify some neurophysiological aspects, such as brain plasticity (brain's natural modification of synapses overtime), cerebral bimodality (considering brain functions allocated either in the right or in the left hemisphere), and the intelligence spectrum (Gardner's range of intelligences considered rather as cognitive talents rather than functions, in order to reconsider the cognitive and learning process thanks to the instrumental mediation of the video activity).

Neural mechanisms of a transformative kind may be effectively supported by the practice of cartoons fruition which has the merit of facilitating the synaptic selection aimed at keeping brain plasticity. The ability of the brain to restructure and reorganize itself over time causes the experiential input, arising from outside or inside, to be constantly managed by a network of synapses that can generate or decay (Goswami, 2004). This is what happens during the use of cartoons employed for learning, during which the adult-educator acts as a mediator because of its educational intentionality and teaches a functional purpose of enabling the practical use of the learner's brain to create more complex neural networks with a higher grade of connectivity.

Furthermore, depending on the type of cartoon, cerebral functions specialize differently, some brain areas are refined in the elaboration of certain stimuli, narrowing more and more the field and locating the functions involved in the visual selecting action; these functions refer to three operational categories that the brain alternately sets in motion during the fruition: action, representation, abstraction. This means that «there is a common scale underlying learning and development, even while different children often learn in distinct ways, moving along different learning pathways» (Battro, Fisher & Lena, 2011, p. 107).

If, in the cognitive field, cartoons become a means of knowledge and socialization, in the communication field, they become an instrument to free the imagination, to experience different ranges of communication, to catch and in-

vent languages, to face daily life problems, to express basic needs, to negotiate opinions as well as it is performed by the cartoons characters living into their fictional contexts which are, however, a mirror of real daily routines. Moreover, cartoons allow especially younger learners to experience real situations of interaction with their peers. Through the sharing of cartoons fruition time, it is possible to «assume and reprocess the data of reality, expand and organize their knowledge in increasingly complex conceptual networks, in a dynamic continuum that sees the learner intrinsically motivated, a star of his/her training» (Caon & Rutka, 2004, p. 10).

Cartoons activate a network of codes and mappings of signs: verbal, non-verbal, visual, acoustic, emotional favoring, thus, the holistic development of the learner. In this plurality of communication input, we may see a form of brain bimodality in the cartoon since it simultaneously enhances the work of the left brain and right brain, usually operating at different times and different ways to the construction of the communicative competence.

Among the factors that can promote the development of cognitive skills, the cartoon is set up as a real situation-problem, governed by internal rules of operation, able to activate the motivation to follow the storyline and pursue a proper and effective understanding of the world. In this direction, the cartoon allows to develop different types of intelligence, namely those that Gardner defines particular fields of intellectual skills possessed by the subject which can potentially evolve and develop thanks to appropriate stimulating factors (Gardner, 2010).

As part of a neural connection between brain stimulation performed by cartoons and the related intellectual type, one might reconsider a classification of cartoons. To give some examples, the visual-spatial intelligence coincides with the ability to accurately perceive the visual world, to manipulate it and change it to the level of mental images. The visual-spatial processing site is the right cerebral hemisphere and, in particular, the rear area, stimulated by those cartoons where shapes and colors are particularly delineated and intense, thus allowing visual information to pass from the occipital lobe to the parietal lobe, to be used for the production of movement in space (Kandel, 2010).

Cartoons that develop logical-mathematical intelligence are those that involve more complex operations of comparison, sorting, grading, and quantification; these are cartoons where the storyline is articulated into sub-scenes containing action units of daily life. The brain areas involved are the Broca's one and the area 40. The cartoon suitable to logic-mathematical profiles has the advantage of stimulating the left parietal lobe, dedicated to mathematical calculation and the right parietal lobe, which deals with the spatial distribution (Bear, Connors & Paradiso, 2007), but at the same time it activates a multi-factorial skill regarding spatial aspects, memory, practical execution, semantic and procedural aspects (Cappuccio & Compagno, 2015).

The value of the cartoon as a possible neuro-cognitive development vector is one of the recent fields of interest of the neuroeducational research. Considering that cartoons may actually contribute to the cognitive and learning consolida-

tion, we may depict a neuroeducational profile of cartoons as a capital tool in the solicitation of different neural districts of the brain. The construction of cognitive schemes, as well as the hemispheric specialization on the basis of intellectual paradigms found in cartoons, are a valuable support to the perception of the adjustment, the exercise of attention, to the maintenance the motivation and the strengthening of memory.

4 A Research Project on Cartoons and neuroeducation

Cartoons are being advocated as powerful motivational and learning tools for various reasons, yet a number of these claims remain hypothetical and require further exploration and validation through empirical research.

The present research contains a design for the development of competences in planning media education actions with cartoons and it was carried out in the Academic Year 2015/2016 with 12 in service pre-school teachers, and 198 university students attending the degree course in Primary Education Sciences at the University of Palermo. The project involved students and teachers, for 40 hours, experienced a media education training methodology for the promotion of competences in planning media education learning actions mediated by the use of cartoons.

4.1 Hypothesis

We suppose that, according to the five areas in the DIGCOM framework (set by the EU commission, in order to favour the spread of citizen digital skills in society), cartoons in teaching can develop knowledge and cognition, visual memory, designing skills in planning media education paths, and can consolidate innovation, citizenship and the learning process.

We expect the following positive effects:

1. development of digital literacy;
2. development of ability of «sailing», or rather to orient within media structures;
3. development of strategic skills and organizational competence;
4. development of ethical competence referred to the responsibility to be assumed for the consequences in the media activity;
5. development of visuo-spatial memory and improvement of brain plasticity;
6. increasing motivation to learn more.

4.2 Methodology

The research project was articulated into two phases.

The first phase aimed at analysing cartoons products through an evaluation grid. Teachers and university students involved after watching several episodes

of each series have filled in evaluation grids for each cartoon. For each series of cartoons, we have, therefore, filled in the grid along with teachers and university students taking into account details such as: the name, the number of episodes, the total time and articulation in the unit of analysis, the origin of production, comments on values and representations of reality.

The second phase aimed at testing and analysing teaching methods. In this phase, we distinguished three potential ways of using cartoons in pre-school:

1. developing skills and abilities: from specific skills like deductive reasoning or memorization, to more contextual ones like co-operation and communication skills, drawing up a list of potential developments through cartoons, with integration in a classroom setting;
2. a stimulus for learning: the cartoon sessions used as a starting point for other activities such as creative writing or charts analysis. cartoons influence affective and motivational aspects;
3. content related learning: the content in the cartoon presented in a very different way as it usually is in the classroom. Simulations remain the cartoons with the greatest potential to directly teach contents, but the accuracy of their driving models has to be irrefragable and learning activities still need to be designed. Cartoons allow direct knowledge and content learning.

Teachers and university students, with the support of researchers, tried to make concepts and principles directly tangible and to promote experiential learning at different levels (imaginative, emotional and behavioural). Teachers furthermore identified the most appropriate ways to help students better see and understand the meaning of what they were learning, so that they could perceive its intrinsic value and «transform» their mathematical and linguistic skills into consistent behaviours.

We use mixed methods.

4.3 *Target*

The sample consisted of 12 in service pre-school teachers and 198 university students attending the degree course in Primary Education Sciences at the University of Palermo.

4.4 *Assessment process*

We used different assessment tools in order to monitor and evaluate initial competences, intermediate improvements and final goals of pre-school teachers and university students. The overall strategy is aimed at improving the teaching skills of school teachers involved in the research.

Before designing the exercises and the methods suitable for the evaluation of the intervention results, we clearly defined which characteristics are most relevant for school success. The initial assessment of students' characteristics required triangulation, comparison and integration of information gathered from different sources.

The use of an observation grid to value cartoons, previously built and validated (Cappuccio, 2014), allowed university students and teachers to gain – along the way – a clear awareness of the outcomes of their cartoons teaching.

The theoretical starting point of the research was the European Commission publication, dating back to 2013, known as *DIGCOM: A Framework for Developing and Understanding Digital Competence in Europe*, which aims to provide a framework for developing and understanding digital competence in Europe. The project dealt with the users’ capacity to make critical and creative use of ICTs to fulfill aims related to work, learning and participation in society (Ferrari, 2013). We also referred to Gisbert & Esteve (2011) whose study of digital competence in university students led them to affirm that when students arrive at university they have a basic level of digital competence, with knowledge of some ICT tools. They have yet to acquire the competencies necessary to master these tools in the educational environment and in their professional development.

According to our hypotheses, we created a CrTDigCom (Cartoon Digital Competence) questionnaire including 90 items, addressed to both teachers and students. They asked about their self-perception of different aspects of their digital competence according to five categories: information and communication, vision and cognition, creation of contents, safety and problem solving.

With teachers’ aid, we developed a rubrics evaluation. Each rubric was developed to reveal university students’ and teachers’ improvement of designing competences in knowledge and cognition, visual memory, designing skills in planning media education paths, and can consolidate innovation, citizenship and the learning process.

Hypotheses have been verified a sit follows (Table 1):

TABLE 1
Hypotheses tested during the experimental process

Instrument	Detection	Hypotheses
<i>CrTDigCom (Cartoon Digital Competence) questionnaire</i>	Pre-test Post-test	Development of digital literacy; Development of ability of «sailing», or rather to orient within media structures; Development of strategic skills and organizational competence; Development of ethical competence referred to the responsibility to be assumed for the consequences in the media activity.
<i>Rubrics evaluation</i>	During the intervention	Development of digital literacy; Development of ability of «sailing», or rather to orient within media structures; Development of strategic skills and organizational competence; Development of ethical competence referred to the responsibility to be assumed for the consequences in the media activity; Development of visuo-spatial memory and improvement of brain plasticity; Increasing motivation to learn more.

4.5 *Experimental process*

The experiment was articulated into three main steps: a) analysis of cartoons, b) designing and developing media education teaching materials and modules, c) testing media education teaching materials.

In the first step (March 2016), teachers and university students analysed 62 series of cartoons with the evaluation grid and they selected the following 10 cartoons in order to design their media teaching activities:

1. Blaze and the Monster Machines
2. Chloe's Closet
3. Daniel Tiger
4. Kate e Mim-Mim
5. Little People
6. Peppa Pig
7. Pj Mask
8. Super Wings
9. Tom and Jerry Tales
10. Zou Zebra

In the second step, the purpose was to plan and develop, with teachers and students, five media education modules regarding cartoons and correlated to the five questionnaire categories.

The training of the teachers is a key element for the effective development of students' digital competencies, not only for the cartoon crafts, that will enable them to use technology appropriately and effectively by adapting it to their students and to the learning they must carry out (Aslan & Zhu, 2015; Gisbert & Lázaro, 2015; Woodruff, Martin & O'Brien, 2015). We agree with McClintock (2007) when he talks of the usefulness and importance of digital technologies in the intellectual endeavor of educators, as they are fundamental resources for generating, disseminating and employing knowledge, values and skills in life.

The activity of developing teaching materials took place from April to June 2016 and was coordinated by university researchers. Each one of those modules was composed of five activities, each activity used an episode of cartoon.

The project activities were coordinated within the Italian education guidelines on pre-school curriculum, applying interactive methods, adopting knowledge outside the classroom walls, organizing various workshops, and using computer technology as an auxiliary tool to the learning activities. A special course was developed instructing university students and teachers about the way to coordinate cartoons activities with the regular lectures from the predetermined curriculum.

Through the cartoons, teachers and university students were progressively introduced into different situations, helping them develop their critical thinking by:

- considering how they can influence their classmates to prefer watch cartoons in groups instead;
- recognizing the advantages for learning while working with cartoons and establishing logical links between each cartoon and the required objectives;

- interpreting the findings, performing self-evaluation and developing the skills to ask critical questions and lead to productive discussion.

Media education concepts were taught according to the cognitive skills and abilities of the students, while solving specific problems via different cartoons thus enhancing the process of logical thinking, ability to analyse, synthesize abstractions and generalizations in a pleasant and stimulating learning environment.

The project activities created a bridge between the teaching/learning process and media, using technology, thus building up a connection between the world in which children live and the way they learn about the world.

Teachers and university students navigated the cartoons space, they constantly received feedback on their actions and they compared their performance to that of others. In addition, they customized their experience by personalizing their character. Finally, the cartoons environment adapted its shape and learning tasks connected to the users according to certain criteria, such as previous knowledge or skills, making the experience both more enjoyable and more effective. Through cartoons activities, participants acquired digital skills, broke out of their social isolation and positively contributed to their community.

The work with cartoons activities provides a highly personalized experience. For this to usually occur, the environment in which learning takes place needs to be responsive to the learners' actions and help him or her reflect on one's self as a social being. The activities with cartoons provide a safe environment, in which both in service teachers and university students (training for future teaching) experimented without suffering the consequences and where they could discuss topics difficult to bring up in everyday life. The ability to engage with each other without having to disclose one's identity has been suggested to make players feel more equal to each other and thereby less restrained than in everyday life.

This aspect of learning and participation using cartoons is relevant for social inclusion initiatives as people at risk have often become disengaged because of negative experiences they had in the past. In the context of a positive and playful environment, where they feel they can discuss their feelings and experiences more openly, they may gain some of the confidence they lack in other contexts. Although the use of cartoons has been varied, no single approach for using cartoon for education has so far emerged, although key aspects of employment of cartoons have often followed the effective use of simulations and have often involved several steps: defining learning outcomes, selecting a simulation, activities, set of activities or cartoon to support the required learning outcome with an appropriate form of assessment, considering an ordering of the cartoons within this set of activities, assignment and assessment process, undertaking the session/s with proper considerations given to outlining the session, learning outcomes strived for and post session debriefing, undertaking assessment of the session participants (self, tutor based or a combination of all).

In the third step, teachers and university students tested the five media education materials in five classrooms of two pre-schools of Catania, with 124 children, from October 2016 to mid-February 2017, two hours a week. University students learned how to link each cartoon to specific curriculum objectives, offering children a new opportunity for integrated learning, encouraging creativity and imagination during learning through cartoons.

5 The results

The CrtDigCom (Cartoons Digital Competence) questionnaire discussion

With the application of the t-test for repeated measures, we have ascertained the significance of the differences between the means of the measured data with the CrtDigCom 2016 (Cartoons Digital Competence), beginning and end of the experimental intervention. The probability that we have chosen to accept as significant the t values has been to $\geq .05$ (confidence interval for the difference of 95%). The statistical results allow us to say that the average value of the range, at each investigated size (information, communication, creation of contents, safety and problem solving), significantly raised after achieving the intervention.

In the chart below (Table 2) you can see the increase in average scores from the start of the intervention to the end of it.

TABLE 2
Synthesis of the average scores achieved at the beginning and at the end of the experimental process

CrtDigCom 2016	Average	Dev. std.	T	Sig. (2-code)
pre-test information and communication area	34	1,7	23,7	<0,001
post-test information and communication area	46,9	1,9		
pre-test vision and cognition area	28	1,6	21,9	<0,001
post-test vision and cognition area	49,5	1,8		
pre-test creation of contents area	32	1,3	23	<0,001
post-test creation of contents area	58,9	1,5		
pre-test safety area	28	1,8	22,9	<0,001
post-test safety area	48,4	1,7		
pre-test problem solving area	36	1,5	24	<0,001
post-test problem solving area	55,9	1,7		

In particular, data resulting from the second administration of the questionnaire better help us interpret all significant improvements tested through the t-test.

In general, the students and teachers perceived that the tasks helped to improve their competencies in all aspects included in the CrtDigCom 2016 questionnaire (Figure 1).

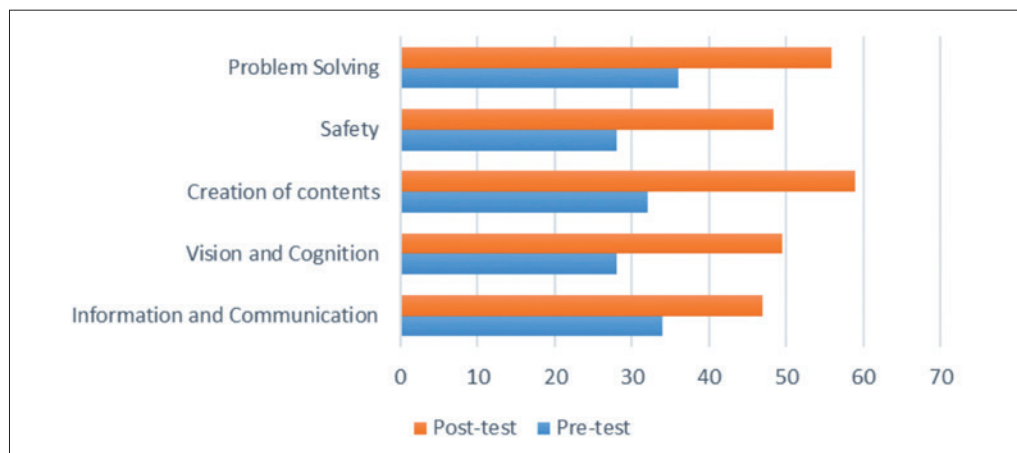


Fig. 1 CrtDigCom: Comparing the averages of pre- and post test

Focusing on each of the areas, we find that *information and communication* is the area in which students, and teachers felt their digital competencies had improved most with each of the tasks performed. In task 2 students had to study the concept of 2.0 in depth. This was the activity that the highest number of students considered had improved their digital competence in information, with 94% (88% teachers) saying they totally agreed/agreed that the task has helped them. Task 4, social networks and digital identity, was also rated as having been positive highly, with 91% (86% teachers) answering totally agree/agree. The list continued with tasks 1 (92%), 3 (90%) and 5 (86,5%), accessing, organizing, analyzing, etc... digital information. The highest rated task was for number 4, where 90% totally agreed or agreed with its usefulness. Next was task 2 (89%), then task 3 (on integration of ICT tools in the classroom) with 87,5%, task 5 (on PLEs) with 83,5% and finally task 1, on educational issues in the society of knowledge where 77% expressed total agreement or agreement that it had helped them to improve.

In the second area, related to vision and cognition, we notice an interesting gap between the average rate of the pre-test and post test. The shift from 28% to 49,5% clearly shows that both service teachers and students improved their vision skills, especially those connected to visual memory (task 1) and visual focusing (task 2). We may state the same ascendant line for cognition, in relation to comprehension (task 3), learning (task 4), concentration and attention (task 5).

The third area had to do with *creation of contents*. The tasks that most students and teachers answered totally agree or agree were 2 (91%), 4 (89%) and 5 (90%). These were followed by task 3, with 89.5%, and task 1, with 77%.

The fourth aspect evaluated with the CrtDigCom 2016 questionnaire, asked students and teachers about *safety*. Although the responses were fairly positive, this was, nevertheless, the area in which students felt they had made least improvements. As expected, given its content, task 4, was the most highly rated, with 95% of the students starting total agreement or agreement that the task had served to enhance their digital competence in relation to online safety and digi-

tal identity. Task 3, on ICT integration in the classroom, appears as that which helped the students least, with 38% declaring neither agreement nor disagreement regarding the usefulness of the task. A similar situation occurs with task 5, where 31% showed themselves to be indifferent.

Finally, *problem solving*, which is the most crosscutting of all the areas. As in the previous areas, the tasks were positively rated, with the highest percentage of students agreeing totally or agreeing that the tasks that helped them with problem solving were tasks 4 (86.5%), 2 (87%), 3 and 5 (81%) and, finally task 1, where 28% were indifferent regarding its usefulness in improving their relation with online safety.

5.1 Rubrics results

Data emerging from the CrtDigCom 2016 questionnaire are confirmed by the analysis of the evaluation carried out through the use of the rubrics.

During the activities, university students learned to discuss and form opinions, make decisions, develop critical and creative thinking for problem solving. Through cartoons activities they were able to memorize and reproduce movements, develop different motor skills and learn to be tolerant, self-reflective while developing a sense of «fair play» and tolerance to others. The cartoons activities brought into light some unexpected social aspects, while some overweight and shy students usually reserved during regular class activities, showed an obvious enthusiasm and courage to take active role in the cartoons and accompanying activities.

We address some issues like the need of accuracy in content: consistency with reality, correct simulations of phenomenon and accuracy of historical facts. Efficient information from the cartoons producers should also be available for the interested teachers. Knowing more exactly what is involved in the cartoon; which contents are presented and how they can affect the pupil would help the teachers to integrate cartoons in their classroom.

Cartoons activities have motivated passive students to contribute more than they would in the traditional teaching/learning environment. Cartoons have motivated their learning by challenging and providing curiosity, beauty, fantasy, fun, and social recognition. Media education modules have reached learners who did not do well in conventional settings context of play.

6 Conclusions

Cartoons embedded in larger educational activities can be very powerful to involve teachers and students. A student learns to think critically about the simulation while at the same time gaining embedded knowledge through interacting with the environment. Cartoons activities provide learners the opportunity to learn by doing, experience situations first-hand, and role-play.

Based on previous researches on media education, we may state that the work is educationally more effective when the activity is characterized by the integration of the language of the media with other languages (alphabetical, graphic, bodily, musical, etc.), but it has to respect specific objectives related to the media competence.

University students and teachers shared a media research path, in which the playful atmosphere of exploration and joyful discovery were widely favored: the kids have worked cooperatively, exchanging and enriching each other's competences both at a communicative and at neurocognitive level.

The training action carried out was meant to promote the participation of students' attitudes to active media product. In this sense, it was possible to detect a significant improvement in the way of enjoying both the content and the expressive techniques of the cartoons proposed. At the end of the training time, the university students appeared more demanding and critical about graphics and scenic setting of media images viewed. Yet, they were particularly focused on a careful choice of contents and underlying or hidden messages in the narrative plots. In other terms, they started to look at cartoons in a real teaching perspective requiring an attentive pre-pedagogical analysis of their features before their use for educational purposes.

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