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EDU-SOCIAL ALGORITHM: A METHODOLOGICAL MODEL FOR USING SMARTPHONES AND INSTAGRAM IN GENERATION ALPHA'S EDUCATION THROUGH A COMMUNITY OF VIRTUAL PRACTICES

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ABSTRACT

The Edu-social Algorithm research project aims to construct a micro-pedagogical, experimental, digital research action to create a methodological model using the functions and algorithms found in social media used by Generation Alpha (specifically Instagram). The project is the manifestation of an explorative research path seeking to alter the algorithms that form the basis of all the major platforms in current cyberspace, and in "Big Tech". This alteration is possible through the development of a community of virtual practice, consisting of students and faculty working within Instagram through an interactive approach, to take pedagogical advantage of their mobile phones and apps. The qualitative results show a series of media-educational content evidencing the pedagogical potential of the social media platform Instagram, and the possibility of reproducing the developed methodological model. The relationships between digital education, social media, and active learning are the prevalent components of this work. Along with these main aspects, this research will also treat the relationship between educational reciprocity and the ownership of knowledge, though the goal of the research action is not only to create a digital methodological model, but a community of virtual practices founded on the approach derived by the didactic strategies intrinsic to the Edu-social Algorithm. The practical aspect of this research involves a target group of classes in the final year of middle schools, reaching a total of 98 students and 57 teaching faculty, participating in the Edu-social Algorithm across seven classrooms in three different schools in Palermo (Italy). The students in the experimental classrooms showed, compared with the control classrooms which followed a traditional model, the possibility of learning through social media and improving one's own scholastic performance, intentionally leaving smartphones on in the classroom, when used in conjunction with educational strategies designed for healthy smartphone use in teaching and learning.

KEYWORDS

Mobile Learning, Community of Virtual Practices, Media Education, Information and Communication Technologies, Generation Alpha

1. INTRODUCTION

Automated thinking was made possible by procedures known as *algorithms*. In information technology, the algorithm is a basic concept. Unlike equations, which have one result, algorithms limit themselves to recording the process for solving a problem (Foer, 2018). They are made up of a series of instructions that regulate and facilitate the at-times chaotic digital activity of human life. Over the years, the term has extended beyond the confines of information technology, accumulating new meanings for understanding and expressing simple and complex actions. Inspired by mathematics, today algorithmic thought is easily converted into a useful practice of organizing actions and ideas in order to behave according to certain determined standards. Education might be treated as a problem needing translation from the conceptual to the practical. Algorithms can allow, through a series of automatically ordered options, a person's process of discovering ideas aiding their own growth. Exploring the vocabulary of information technology inspired and became the foundation of, the general hypothesis guiding the reflections in this pedagogical research. This project looks to the future, but the results are largely grounded in the daily post-modern reality of constant technological inter- and hyper-connections. For a list of instructions to be considered an algorithm, only the following requisites must be satisfied:

completeness: every algorithm must be complete, meaning that each instruction must be able to be executed in a finite time and number of times; generality: every algorithm must provide the solution for a category of problems: at the same time, it must be applicable to any group of data and must produce results; non-ambiguity: each step to be followed must be defined distinctly, without paradoxes, contradictions, and ambiguities. Furthermore, these steps must be elementary, that is, unable to be broken down further; able to be understood in a direct and unambiguous by the executor, whether human or artificial; and completed in a defined time with an unambiguous result (Palladino, 2020). The algorithm tool which follows (figure 1), named *Edu-social Algorithm*, was built following these criteria. The end goal is to accompany students in forming a community of virtual practice called *Edu-social Algorithm.*

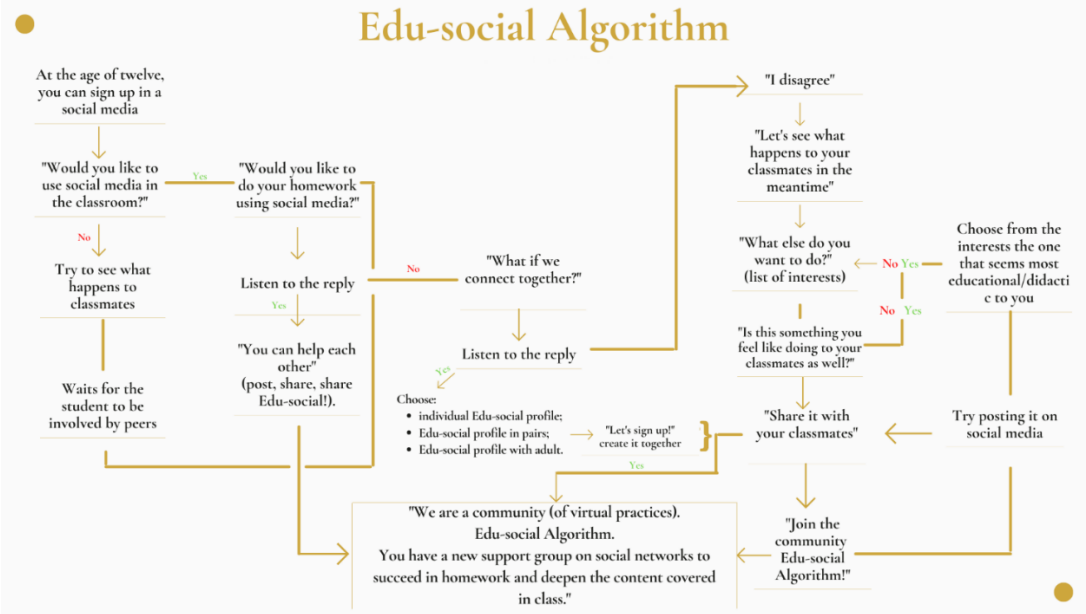

Figure 1. Algorithmic tool for the application of Edu-social Algorithm

There were two fundamental components of this research-action. On the one hand, pedagogy, to try and understand how the methodologies in education studies are responding to the new complexities of cyberspace. For this research, we adopted a heuristic-experimental research perspective of content and action, taking into account the significant pedagogical factors in Generation Alpha's educational experience thus far, and going beyond traditional, ready-made models of in-person and virtual education. The main objectives of the research-action were:

- to verify the pedagogical validity of social networks as media-educational tools;
- ideate, plan, and develop a community of virtual practice called the *Edu-social Algorithm;*
- to educate on a healthy use of social networks, when seen as tools functioning for students' scholastic performance and teachers' sense of self-efficacy.

2. CHOOSING A TARGET: GENERATION ALPHA AND DIGITAL LAUNCH

We can already see glimpses of education's future in how and where Generation Z spends its free, social, and alone time. Today, no adolescent does not have at least one tech device in front of their eyes, on their wrist, in their ears, or in their pockets (Gheno & Mastroianni, 2018). The next generation, Generation Alpha, affirms this picture even further. The psychologist Lancini in an interview with ANSA (2020) defines it as "the first generation that perceives technology not only as a means but as an integral aspect of existence. Raised with a tablet and a cell phone always right there, they are the children of parents who invest a lot of time, resources, and care in their education."(https://www.adviseonly.com/economia-e-mercati/economia-politice-e-

societa/largo-alla-gen-alpha-veri-nativi-digitali-e-con-unanima-green/). The kids of this generation are digital native speakers, with digital-speaking parents who understand the potentials and risks of the Internet and its ways. The digital world has influenced the last thirty years of human life. Since the 2000s, the Internet has connected a large portion of the global population, with a computer or smartphone, creating the feeling that the risk of potentially unbearable individual isolation has been eliminated. According to the report *Digital 2018: global digital overview* from Global Annual Digital Growth, "Big Tech" has five billion registered users around the world, of which more than three billion are exclusively *social mobile.*

The landscape in Italy is no different, and follows the international trend of an exponential growth in the use of the Internet and various social media. Surveys from We Are Social and Hootsuite show that 57% of the Italian population is active on social networks. L'Atlante annuale dell'infanzia a rischio (Annual Atlas of Childhood at Risk), edited by Treccani in 2016 and born from the work of Save the Children Italy, analyzed the social fabric of youth and reported on numbers regarding minors in Italy: in 2015, more than one out of three minors surfs the internet every day (38.6%). In a sample of one thousand minors between the ages of twelve and seventeen, almost everyone (95%) has a profile on at least one social network. The average age for owning a first smartphone has lowered every year since 2001, reaching age eleven in 2017. A pre-teen owns at least one device that connects to the internet. These digital natives seem to use the internet mainly to stay in contact with their peers, through instant messaging platforms like Whatsapp, Messenger, or Telegram. Many of them know how to independently update their own Facebook and TikTok profiles, add stories and photos on Instagram or Whatsapp, and look for new friends in the hopes of feeling understood, appreciated, seen, desired, validated with an extra like or message (Castiglione et al., 2018). The psychologist Lavanco (2021) observes how children today are born in the world of the possible. With the excess of choice comes the risk of dependence. But what determines that behavior? Narcissism and the importance of being aesthetically affirmed. The need to think of oneself as the strongest, or best, representation of a particular quality, reinforcing natural pre-teen inclinations: to be totally perceived or to disappear completely. Pre-teens and adolescents live in a social media world of appearance and perception, based on images, and it allows for the capacity to seduce, to show one self, expose onself, or behave in extreme ways to attract others: for followers. Another collateral effect, notes Lavanco, is anxiety combined with a widespread lack of language for emotional expression, confusing emotions and roles in the adolescent mind. It is a time when the adolescent cannot distinguish between love and friendship, parents and friends, teachers and parents. On social media, this confusion manifests as a collective incapacity for understanding emotions. This is also the result of lacking and inadequate digital education, which should be guided by adults, working alongside young people, to develop the way together. The pedagogical experience should be seen as a collaborative one, a way to recognize one's own limits and potential.

Today, the algorithm holds a central place in our lives, involving our emotional plane and changing our decision-making processes (Nowotny, 2022). In the last few years, new and ever-more sophisticated systems of artificial intelligence have been developed, and not just for social media. As already discussed, the algorithm has become one of the basic tenets of information technology and artificial intelligence, but originally it was not a purely scientific concept. An algorithm is first and foremost a system, and skills, calculation, and creativity are needed for that system work correctly. Algorithms have always been considered precious, but technological progress has rendered them even more efficient and, at times, risky. Machine-learning has made these systems even more powerful, overthrowing the scientific method, as the designs emerge from data and correlations, rather than being guided by hypotheses (Foer, 2018). Depending on how they are used, algorithms can present amazing feats of logical reasoning, make life on the internet easier, allow old friends to reconnect, locate the book you were desperately trying to cite, find a way for enriching learning, or introduce a work opportunity that could set the digital user on the path to their future.

Recent research commissioned by BNP Paribas Cardif and conducted by Friendz, Technological, Inclusive and Green: Welcome Generation Alpha! (2020) helped show certain significant aspects of the generation of children born after 2010. Some of the most representative data in this research on technology shows a deep relationship to social media. "According to reports from parents, 62% of children begin using technology before age 5; a percentage which is trending upward each year, showing that the age of initial exposure to technology is consistently lowering. As expected, children mainly use smartphones (62%) and tablets (55%). Further, 53% can claim exclusive ownership of at least one device, even if only 9% has complete autonomy in using it, while 45% are always under parental control and 46% sometimes under parental control when using devices. What do they use them for? To play (50%), to watch videos or cartoons (21%), but some also use it for school (10%)" (BNP Paribas Cardif, 2020).

This research gives a first look at understanding the undeniable value and impact of technology in the lives of pre-adolescents of this generation. Knowing what the world was like before the technological revolution allows for a critical view of the present. But there is a risk of a "nostalgic pedagogy" that could condition our response to the new demands that education is being called on to confront. (Lavanco, I social e le dipendenze, from the cycle's online seminar "In trappola nella rete", 2021). We must adapt to the speed and rhythm of this technological evolution, and its many changes. With this perspective, the algorithm can be seen as a useful tool for working in educational contexts, in-person and virtual. The meaning of algorithm has grown far from the definition given to it by the Persian intellectual Muhammad Ibn Musa al-Khwarizmi. Over the course of the last few years, the term "algorithm", thanks to social media, has become part of colloquial language. App developers and tech engineers consider an algorithm a tool that is able to select, from among thousands of possible combinations, a "ranking" of the content that the user sees as soon as they login to their account. This model is created based on data freely offered by users whenever they search, comment, share, like, or even talk about something near a device connected to the internet. It is a sophisticated facilitator of content, able to sift and sort notifications that might be interesting to millions of users with social media accounts. It is a filter of knowledge that adapts itself to the user's interests, and at the same time triggers new interests based on its programmers' intentions (Cappello, edited by, 2020).

These considerations brought forth the Edu-social Algorithm project's general research question: is it possible to use smartphones, and to adapt social media algorithms for media-educational purposes?

In this first experiment 7 classes, 98 students, and 57 teachers were reached, through carefully created social media accounts with the usernames Edu + first name + last name, used by all involved participants (students and faculty) across three different middle schools in Palermo, located in neighborhoods deemed at risk for poor education and high dropout rates. The collective creation of new accounts by the project participants was the launch of this experiment for a community of virtual practices. This community uses algorithms and has a pedagogical focus. It is activated by educational and didactic content uploaded and shared by connected users in a virtual space within Instagram, and aims to promote a positive change in the teaching and learning of students in Generation Alpha. In the four months of executing this project, the smartphone became more than a purely technological object. It began to be considered as, and converted into, a tool for learning, in line with the theories and practices derived from Mobile Learning for the educational future of Generation Alpha and the generations to follow.

In Italy, a law went into action on September 20, 2018, following European regulations (Gdpr, May 25, 2018) that decreed fourteen as the minimum age required for accessing a social network or instant messaging service. Currently, in Italy, no thirteen-year-old minor can sign up for any social media platform, despite the American and Chinese laws that govern the companies that run these platforms. Corroborating these norms is the warning issued by the Italian Data Protection Authority (Garante della privacy nazionale), after a criminal case in Palermo involving an alleged challenge killer and a ten-year-old girl. Parents who want to sign their children up on social media networks between age thirteen and fourteen are liable for the consequences; this rule abides by culpa-in-vigilande (vicarious culpability), a practice at the basis of Italian parental civil responsibility. Despite the fact that by law minors between eight and thirteen are not permitted to sign up for social media or instant messaging platforms, the sale and ownership of sim cards for minors that have turned eight years old, with permission from a parent or guardian, is permitted. This sale often includes offers from phone providers for installing apps with parental controls.

At the international level, today, the main social networks and messaging channels follow these age restrictions:

- Facebook and Instagram: the minimum age requirement is thirteen years old, minors between thirteen and fifteen years need parental consent to use social media;
- WhatsApp, Messenger: if the user resides in a country within the European Economic Area (includes the EU), the user must be at least sixteen years old (or the oldest age required by Country). If the user resides in another country, outside of the European Area, the user must be at least thirteen years old.
- TikTok: since February 9, 2021, the platform blocks users under thirteen through an age verification system;

In Italy, the minimum age requirement has been set at fourteen years old. However, the threshold is thirteen for the main platforms listed above, who have not changed their policies to adapt to Italian law, making it easy for thirteen-year-olds to access social network platforms. Thirteen to fourteen is exactly the range of ages that currently marks the first members of Generation Alpha. With this in mind, this research design has resolved to

transform the educational methodological model, based on the tool of the Edu-social Algorithm, in order to create a community of virtual practices within Instagram, the app most used by Generation Alpha along with TikTok. The end goals are to find new educational ways to adopt in scholastic settings (and outside these settings), for the defused use of a new digital methodological model to introduce at the exact moment at which a pre-adolescent can legally become a part of social media cyberspace.

3. METHODOLOGICAL PROCEDURES

In a first investigation, we considered sources and data from a variety of national and international scientific studies, including those on: online teaching contexts (Marcus-Quinn & Hourigan, 2021), learning to cope with complexity and adolescents online (Amendola et al., 2018); digital education and digital teachers (Volpi, 2021); the theory and implementation of Mobile Learning (Kearney et al., 2020); participatory culture and digital competence (Jenkins, 2009); social media education (Kai Wha Chu, 2020); algorithm as educational instrument; education among peers with supervision by educational personnel. A comparison to these educational models will follow, taking into account the evolution of individual generational facts (McCrindle & Fell, 2021), and connecting them to the general progression of the education system. This comparative perspective developed a micro-pedagogy thanks to this previous research, and drawing on reflections of experienced educational personnel in the project as a research resource: e-tutor faculty, researcher-instructors. The faculty was also involved in a training centered around the Edu-social Algorithm methodological model for creating the approach to be used within classrooms. A useful point of reference for the research was the study relating to Dig Comp 2.1: A Framework for Developing and Understanding Digital Competence in Europe (following link: publications.jrc.ec.europa.eu/repository/handle/JRC128415) a tool for improving digital competency in citizens, applicable to educational contexts. DigComp provided a dynamic definition for digital competence, not defined by the use of specific tools, but to the needs that each citizen holds (Cartesio M.L., 2020).

Along with pedagogy, the main focus point was the digital world and its algorithms. This research focus deepened the theme of digital education through social media. The chosen methodology was research-action (RA). The main purpose of this style of research consists in actively involving all subjects included in the study. An informal involvement, aimed at promoting change (Benvenuto, 2015). To answer these questions, the research-action Edu-social Algorithm was developed in three phases:

I. Phase I (plan): identification of subject definition of project and collective problems with the involvement of target teachers.
   a. Intervention description: Along with source and data collection from pedagogical research on digital education, in this first phase of research partner schools were chosen. Project was shared with the schools, and the involved school education staff was chosen. From subject, project definition, and research-action questions, a methodological format was created from the theme, definition, and research-actions questions, focused on using smartphones during class as educational resources, in order to collect significant positive and/or negative experiences useful for the development of an educational model that has a phenomenological approach to social networks. On this occasion, a handbook will be created using DigComp sizes, Netiquette concepts, and a relevant glossary on digital education for the diffusion of a common digital pedagogical culture. Focus points: problem identification; analytically examine and explore possibilities and understand limits; conceive a methodological format known as Edu-social Algorithm; plan phase II. Assessment tools: focus group and training (teachers); participatory observation (researcher); focus group's reflective report (researcher).

II. Phase II (act): Application of methodological template related to Edu-social Algorithm + creation of the empirical basis.
   a. Intervention description: This second phase of research is entirely characterized by the launch of the practical experiment. The experimental group and control groups in classes were chosen by the researchers, after completing training, learning the tool Edu-social Algorithm and choosing the teachers to work in Generation Alpha's classes. The implementation phase included the creation of a methodological model with the teachers and the experimental group students in order to create a time and space for digital education. This step involved paying

attention to all the components and activating the students through the Edu-social Algorithm, with the purpose of developing a community of virtual practice on social networks. In addition, this step provided the empirical base with the first collected data.

b. Focus points: launching and promotion of experiment; data collection; creation of a community of virtual practices.
c. Assessment tools: research diary (researcher); journal on insights and observations (teachers); digital storytelling on Instagram (teachers and students).

III. Phase III (observe & reflect): final theorization and elaboration of collective processes.
   a. Intervention description: after the practical experimentation in Generation Alpha's educational contexts with the methodological template produced by the research-project Edu-social Algorithm; the last phase was dedicated to the collection of qualitative and quantitative data produced in the first two phases, for the drafting of an article for academic publication. This phase referred back to the use of assessment techniques and methods with the tools used in previous actions.
   b. Focus points: critically assess the process; discuss, deepen, analyse (comparison forum).
   c. Assessment tools: Narrative inquiry (Clandinin & Connelly, 2004) on the collected data (researcher); report (researcher).

Methods: complicating factors and variables were considered valuable in this experiment, following the explorative-interpretive method regarding the observation of faculty and student behaviors within the designated social networks. An experimental method was used for the application of the Edu-social Algorithm in training contexts for teachers who took part in the experiment. Evaluation tools were developed in order to track students' progress, and for understanding the positive and/or negative effects of the research.

Research Queries:

- Can education go viral thanks to smartphones and social media?
- Can you create social media teachers, or media-educational students—*nano influencers* (F. Pira, 2020)?
- Can we configure social networks to create a new methodological model as a response to the new educational challenges facing Generation Alpha's teachers?

4. RESULTS AND MATERIALS

The overall results (figure 1 and figure 2) demonstrate the reactions of the participants using the Edu-social Algorithm methodological model. They used media as an education tool for the planning, theoretical development, and practical execution of a methodological model aimed towards the creation of a community of virtual practices, to be used in the teaching and learning of Generation Alpha, who uploaded, shared, and commented on media-educational content. In the pilot class, after faculty training and focus groups with students, we developed additional materials for evaluating learning with the Edu-social Algorithm. Throughout this project, we also grappled with the means and function of smartphones used in the classroom within a delineated time and space. A community of practices, in line with this research project's aims, grew within Instagram. This community was made up of teachers and students who continue to use these educational accounts to upload core lesson materials. An activity sheet (figure 3) and evaluation (figure 4) aided faculty and students as they integrated material from the Edu-social Algorithm model into their classroom.

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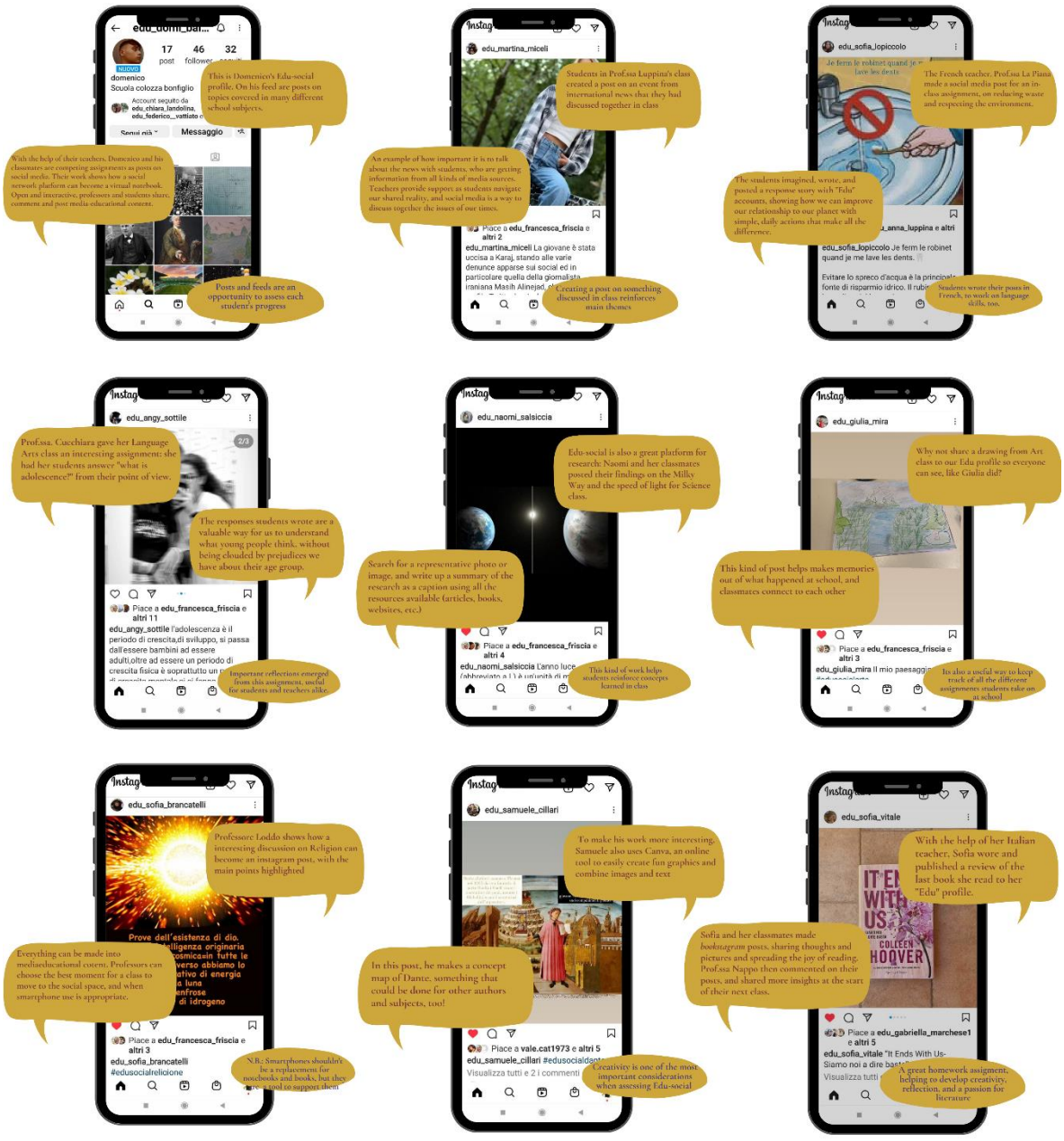
Measuring Progress and Early Results

The key indicators of progress for the Edu-social Algorithm model are the student posts on the community feed. Here are a few examples of the educational content students have shared on Instagram*



*FURTHER INFORMORMATION ON THE PROJECT CAN BE FOUND ON THE INSTAGRAM PROFILE "EDU_SOCIAL_ALGORITHM"

Figure 1. Posts published by Edu-social students

Figure 2. Posts published by Edu-social teachers

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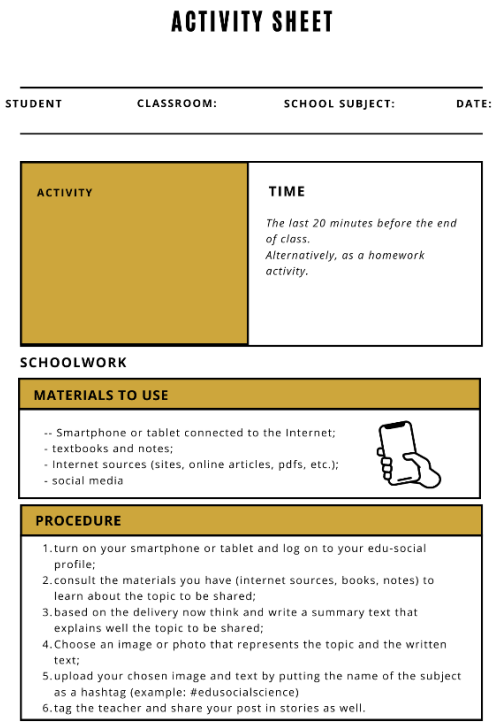

Figure 3. Activity Edu-social Sheet

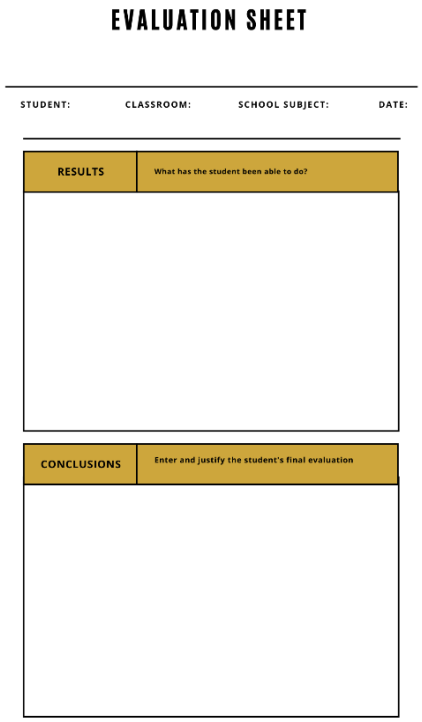

Figure 4. Evaluation Edu-social Sheet

The e-tutor faculty showed, through the training, a model of how to exist online in a human and authentic way, learning how to created meaningful relationships online, overcoming instinctive or primitive attitudes. This study provided an occasion for true intergenerational exchange, and educational reciprocity in the enormous and experiential territory that makes up most of every day in the lives of Generation Alpha students and their adult reference points. With this educational framework, we also kept in mind the potential risks to the lives of youth online, regarding: identity theft; security failures; phishing; hate-speech and incitement; online child grooming; conditions and behaviors of extreme risk (challenge killer); cyberbullying, etc. At the same time, given the widespread attention to the prevention of these increasing phenomena, we tried to understand with the teachers how and how much the approaches and policies of social networks, within Europe and outside of Europe, affect the regulation of online behaviors. This action aimed for horizontal work online, involving everyone: students, social media teachers, and research teams, collaborating to find ways to make education viral, and to create a cultural pedagogy of social media, with educational clicks powerful enough to change the algorithm.

5. CONCLUSION AND DISCUSSIONS

“Edu-social Algorithm: a Methodological Model for Evaluating the Impact of Social Media Network Algorithms on Generation Alpha’s Education Through a Community of Virtual Practice” is the complete title of this research design, presented for the doctorate in the Department of Psychology, Educational Sciences and Human Movement at the University of Palermo. The project involved three middle schools in Palermo for the implementation of a methodological model that has followed the increased classroom use of smartphones connected to Instagram with specific “Edu” accounts. In these last few months, 7 classrooms, 98 students, and 57 faculty across three different schools in Palermo (“I.C.T. Principessa Elena di Napoli”, “I.C.T Colozza-Bonfiglio”, “I.C.T Lombardo Radice”), participated in beginning to create a new kind of school, within social networks. Thanks to the participants, the virtual space has become a learning space, a space for sharing pedagogical content, working on assignments, doing homework, giving information, and

uploading classroom work. The project, with school cooperation, will continue, with possible developments and the hope of bringing other schools into this experiment of transforming social media into a tool for education. The initial student response has been positive, and teachers have also started to notice improvements in participation and scholastic performance. While it is too early to understand its long-term value, the general attitude and the first media-educational content that has emerged from the methodological model in action are hopeful indicators for the pedagogical potential of social media. With teachers, we addressed the time and space given to this new model, specifying that the intention is not to substitute learning with notebooks, books, and computers, but to use the smartphone as another resource for Generation Alpha's education. This Generation, after Generation Z, sees technology as an integral part of their lives. For that reason, it is fundamental to help them develop, in a protected context like school, a healthy relationship with social networks and smartphones, as suggested by Mobile Learning, the pedagogical style integrating mobile technology in scholastics settings as useful instruments for learning, inside and outside of school. This experiment has tried to build a bridge between different generations, to create a new pedagogical path, full of surprises and new ideas for rethinking school, smartphones, and social media.

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