
Digital Literacy Circulation: Adolescents and Flows of Knowledge about New Media

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Abstract: The aim of this paper is to discuss the output of an empirical research on digital skills in order to develop a typology of skills circulation among young digital users. Relying on research on digital literacy in media studies and on users in STS, in this article we start criticizing the concepts of “digital divide”, “digital inequalities” and “digital competencies”. Then, we present the principal results of a research study involving 50 adolescents in Italy about how they acquired their competences in the use of digital media. This gave us the opportunity to focus on the digital skills of young people and the development of their abilities in using digital media. The research outlines the patterns of circulation in digital competences among young people in relation to family, school and peer group, defining four kinds of “flows”: parental flow (involving fathers and mothers), peer flow (connected to friends and people of the same age), educational flow (referring to formal education) and technological flow (involving technological devices, such as computers, laptops, smartphones, tablets, etc.). The aim is to understand the interactions between digital skills and the social, institutional and technological conditions that influence the youth’s digital literacy for the everyday use of digital media.

Keywords: new media; digital literacy; digital skills; digital inequalities; bricoleurs.

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Buying the right computer and getting it to work properly is no more complicated than building a nuclear reactor from wristwatch parts in a darkened room using only your teeth.

Dave Barry, *In Cyberspace* (1996, p. 39)

1. Introduction

Commentaries about new media often stress the development and diffusion of mobile and digital communication platforms and the increasing availability of technological devices. On the one hand, these commentaries describe ICT as instruments that generate important changes in interconnected and networked contemporary societies (e-vote, e-health, smart energy, logistic, transportation, construction etc.). On the other hand, these commentaries underscore the risks connected to the uncontrolled and incautious use of the web (privacy and copyright violations, telematics frauds, child pornography, enticement, etc.). ‘Cyber-optimistic’ and ‘cyber-sceptical’ are terms that define divergent frames that counterpoise democracy, participation, freedom and rebellion against control, authoritarianism and manipulation. It is a debate that reveals the necessity to understand the distinctive forms of use of digital resources and also the quality of the access itself, which allows users both to benefit from the opportunities offered by new media and to avoid the risks that so alarm public opinion. This is particularly relevant when we look at children and adolescents and their styles of ICT consumption (Buckingham 2007; Livingstone et al. 2011, 2014).

Our article proposes both theoretical and operational reflections on the concepts of *digital divide*, *digital inequalities* and *digital competencies*. Based on an international set of contributions (Hargittai 2002; 2010; Helsper and Eynon 2010; Liff and Shepherd 2004; Van Deursen and Van Dijk 2011), these concepts are the departure point to develop an empirical analysis around the skills of Italian adolescents and the improvement of their digital capacities. In this paper we describe the principal results of a research study involving 50 adolescents in the North West of Italy. This study reconstructs the patterns of circulation of digital competences among young people, in relation to family, school and peer group. The objective is to understand the connections between digital skills and the social, institutional and technological conditions which influence digital literacy.

2. Digital Divide and Digital Inequality

The term “digital divide” frequently assumes very different meanings. The origin of this term is unclear (Norris 2001; Gunkel 2003); it is used principally to express the problems connected with physical access to ICT, different forms of access to information, quality of available technology, technical problems related to devices, etc.. In fact, the concept is much more complex, as it relates to the different opportunities and uses of communicative and informational resources, which depend on traditional sociological variables, such as socio-economic status, gender and

age. From this perspective, it has emerged that today the younger generation is generally more active than adults and seniors in its use of computers and the Internet. Due to the costs of connection, a portion of the population cannot use the Internet, whilst those who are able to afford these costs are generally part of a more advantaged class; people with a higher level of education tend to connect to the web for longer periods of time, using its resources to do a much wider range of activities than those less educated; women are more excluded than men, etc. (Le Boterf 2000; Bolt and Crawford 2000; Bimber 2000; Bertot 2003). Di Maggio and Hargittai (2001) and Warschauer (2003) prefer to use the terms *digital inequality* and *digital inclusion* to underscore the transition from those who have and do not have the Internet to the analysis of what people do with the Internet and what they are able to do when they use its resources. Network society imposes the massive use of digital media, from which to be excluded is of course a source of inequality. However, the inability to use digital resources also represents a disadvantage. In line with this reasoning, Hargittai (2002) identifies a second-level digital divide to explain that the more people have access to digital media, the more important other factors become, connected to the ability to take advantage of informative, relational and participatory potentiality. Beyond the theoretical point of view, it is necessary to deal with a range of competences and skills, each related to technical aspects: the ability to move into digital spaces, to select information, to have a critical and proactive approach to the content mediated by digital media, to interact, etc. In this light, the notion of digital divide becomes a *continuum* of different unequal levels of access, usage and benefits drawn from new media. This continuum connects two hypothetical poles: on the one hand, the absence of access and, on the other hand, an efficacious use of technology. For understanding the changing role of social and cultural factors, we adopt a multidimensional and flexible definition of digital divide, declining it into the plural form of *divides*.

3. Literacy and Competences Circulation

As we have argued, the understanding of the digital divide as a continuum of inequality connected to a wide set of factors can help to encapsulate the digital revolution in terms of development, freedom and prosperity. Moving from this perspective, we should focus on the system of diffusion of knowledge, literacy and digital education for the individual. According to Van Dijk (2005), it is necessary that a more articulated ability to manage information and digital relationships is acquired, above the more basic operational skills which are necessary when using technological devices and software. Van Dijk discusses *informational skills*, connected to the ability to select and process information, and *strategic skills*, referring to the ability to use appropriate communication technology to

reach specific goals. In relation to young people, as we will examine in the next section, they are more familiar with digital media (Livingstone et al. 2011 and 2014) but there is the important problem of *critical skills* (Gui and Argentin 2011). Such skills – cognitive, informational, creative, cultural, ethical, social (Buckingham 2008; Jenkins 2006) – are deemed necessary to select and evaluate available resources. In order to respond to this wide and composite combination of abilities, skills and resources, the concept of *digital literacy* has been introduced, borrowed from a literacy concept that Aufderheide defined in 1993 as the ability to gain access, analyse, evaluate and produce a message through different forms of multimedia communication. Warschauer (2003) suggests that there are four simple skill groups: *computer literacy* (a minimal knowledge of hardware and software, operating systems and Internet surfing); *information literacy* (skills used to manage information obtained from the Internet, connected with an ability to look for, to select, to save and to archive information, whilst evaluating usability, reliability and trustworthiness); *multimedia literacy* (as highlighted by convergence demand, the ability to manage, understand and produce a multimedia environment where codes and languages interact continuously); and *CMC literacy*, representing the skills and competences needed to communicate effectively online (using e-mail, chat, Social Network Sites) and those needed to discern formal and informal environments. It is, perhaps, an easy way to observe and empirically track the ways in which digital media use may diverge across users. Eszter Hargittai (2007) proposes a more articulated subdivision, which explains the different levels of competency/incompetency that may be experienced by individuals. It includes: the effective and safe ways of communicating with others, a skill related to the ability to make adequate communication (for example, the ability to limit the risk of not receiving a response to an e-mail due to the object not being clear); the knowledge of how to contribute to group discussion and share content and, therefore, how to comment on a blog, to construct a mailing-list, to share User Generated Content and to contribute to the collective creation of a document; the knowledge of the use of tools and what is available online; the ability to access sources and judge credibility of messages, demonstrating the ability to determine the reliability of sources and to avoid phishing. There are then skills referring to online privacy and safety, which are the minimum skills used to avoid risks related to the diffusion of personal data; the knowledge of where and how to seek assistance, a skill connected to the capacity to ask for assistance with an online service and from other users; customization, being the ability to adapt and to personalise information. These models by Hargittai and Warschauer demonstrate how we need concepts and instruments to be able to fully understand the specificity of new media. It is necessary to explore and to engage flexibly with the problems and the innovative technological environments, whilst being able to read, select, interpret and evaluate information, also knowing how to interact with other people in a constructive and responsible way. These

models include skills connected to access, analysis, evaluation and participation, defining a new agenda for research and for policies. According to Livingstone (2009), there are still many questions to be answered. For example, can we determine the level of safety of communication? In a measurable manner, what does it mean “to contribute to a discussion group”? How can we evaluate the reliability of a source? According to the social literacies approach (Street 1995; Barton et al. 2000), discussion surrounding the level of literacy and skills acquired by individuals must not disregard the role of social practices, as they are connected to the way in which the individual resolves the problems with which they must engage. We gain skills from the way we engage with certain challenges and we explore beyond this. What we suggest is that people respond as social actors, inserted into a specific point of social structure with determinate resources (economic, cultural, and relational), connected to the experience of using technology, the accessibility of hardware, the use of software, as well as the evaluation of these online services. This fits with the well-known process of *domestication* (Silverstone and Hirsch 1992), a term coined to describe the integration of technological objects into daily life and, above all, the complex – circular and co-constructed – cultural dynamics within which users appropriate technologies. Literacy is not only connected to technical and neutral skills, but is a set of abilities obtained *socially* and *culturally*, producing a legitimacy and illegitimacy of knowledge content as well. According to Sonck et al. (2013) and Magaudda (2011), there is a circular dimension of the processes for the construction and acquisition of skills. Technology has inserted itself into existing social practices, adapting and shaping itself to the individual's needs, all the while creating a sort of inter-dependence between device and user. A relationship with a technological object goes inside processing and involves the rethinking, readapting and modifying of the technology, according to the contingent needs of the user. Fundamental actors in this process are the designers who participate in the circular dimension of users' literacy. From the beginning, the Internet expanded its audience to involve larger groups, who stimulated further changes in the use of the network. From primary software, which was less intuitive but less complicated to use, we arrived at the birth of more complex software, with the creation of applications and content, easily available information and, thanks to web 2.0, the opportunity for user participation in constructing such software. Literacy is a set of abilities socially and culturally obtained, connected to technical skills, producing legitimacy and illegitimacy of knowledge content as well (Winner 1980). So, the user is not an isolated individual, whose relationship to technology is restricted to technical interactions with artifacts: he is a part of a much broader set of relations than user-machine interaction, including social, cultural, and economic aspects (Oudshoorn and Pinch 2003). There is a circular process that is, in some ways, co-constructed, made by innovations and the reshaping of practices and technology where users play a complex role. We

would like to propose an observation of this process, regarding the role played by those who are considered most involved: young people.

4. Digital Literacy and Youth

Age is one of the most effective categories used in analysing the digital divide and we take for granted that it is negatively correlated with technology adoption. The generation gap may be decreasing, but it still persists. Older people rarely have the relevant skills or technical cognitive abilities necessary to use digital media and they have a reduced interest in learning or improving their knowledge relating to ICT. Born before the explosion of the information society, they usually experience the technological revolution in a passive way, without being involved in on-going processes and transformation.

Children and adolescents are the actors upon whom we focus our reflections regarding participation in the information society, whilst it is more usual to consider older people when speaking about e-exclusion. Terms used to describe the relationship between youth and digital media are varied: the web generation, the Internet generation, cyber-kids, etc. One of the most commonly used is *digital natives* (Prensky 2001; Bennett et al. 2008), used to identify those who grew up with new communicative technology. In opposition to this idea, there are the terms *digital immigrants*, for those who only approach new media later in life, and *late digital*, for those who regard technology with a kind of *technophobia*. The generation gap is constructed by specific skills requested by digital media. In relation to traditional media (books, cinema, television, radio, etc.), many adults would not favour the content consumed by young audiences (Riva and Cefalo 2014). However, they are able to switch on these media, they are able to use them and they could consume this content if they chose. In relation to digital media, operational and critical skills transform many parents into digital immigrants in the information society, where their children live as natives.

According to the media and popular opinion, digital natives and the *net generation* (Tapscott 1998) are the result of the effect of cognitive shaping, provoked by the spread and circulation of new technology. These have generated new thought and new styles of communication and learning. This view has merit, but as Mascheroni (2012) reflects, it oversimplifies the issue for two main reasons:

1. Studies and research on ICT use show that it is not age difference alone that determines the use and interpretation of digital content. As we stated earlier, these rather depend on classic factors connected to social stratification, experience of using content and the presence of digital media in everyday life. Digital natives, more correctly, are those who have used the Internet *for a long time*, *for long periods* of time and with competence. Therefore, this does not automatically mean young people and

does not only include young people.

2. Optimistic ideas that young people are naturally Internet experts just because they are young lead to the de-legitimation of political and educational actions aimed at educating young people about using digital media with awareness. It is clear that not all adolescents and children are able to cope with the risks that are presented by the Internet. Thus, it is essential that the necessary skills are discussed in order to stay safe whilst using digital media.

When using digital media, young people adapt themselves to the appropriate technology in a continuous and circular process, constructing experiences that enrich their own senses. The expression *bricoleur high tech* (Drusian and Riva 2010) proposes a different way to observe the appropriation process of digital media. Young people are able to take advantage of new and traditional media and combine them. They are able to move nimbly from SMS, to Facebook, to face-to-face communication, according to what they want to say. Young people choose the device most indicated to transmit a specific message in a determinate moment. It is an open process of bricolage, which is typically flexible, extremely adaptable, and that follows a never-ending succession of symbolic and instrumental changes. Where do these skills come from? How do they circulate between young people and older people? What is the role of the school in this process? What about technologies?

In the following pages, we present the results of a research study on the circulation of skills among young people themselves and among young people, socialisation agencies, technology, and the skills that these trends depict.

5. Methodology

The aim of the study was to understand how digital literacy circulates among young people and the reasons youths give for their choices and practices. The research focused on adolescents' everyday experiences and adopted an "adolescent-centric approach", where "methodologically and conceptually [adolescents] must be free from the process of containment that produces them as 'other' and continues to silence them" (Caputo 1995, 33). We chose qualitative methods to study the phenomena and the experiences of subjects, starting from their points of view (Flick 1998). Thus, the research adopted a semi-structured interview technique, with computer and smartphone support. During the interviews, digital media could be used by adolescents to better explain their experiences, using examples, opening their SNS profile, etc. Each interview lasted from 60 to 120 minutes. The empirical group involved 50 adolescents (25 boys and 25 girls), aged between 16 and 18, living in North West Italy and selected by a theoretical sampling approach. The principal criteria used to compose the sample were gender and age and we recruited participants

thanks to schools that permitted us to present the project to their students. Interviews were audio-taped and transcribed verbatim. The resulting data have been analyzed by ATLAS.ti software, using thematic analysis as a specific model of narrative analysis aimed at finding common thematic elements across participants and the experiences they reported (Riessman 2002).

As previously explained, skills are not only related to technological aspects, but merge with social factors, thanks to the possibility of involving people in the communication process (by UGC for example). By combining the findings of previous studies mentioned in the literature review section of this paper, which analysed qualitatively the skills connected to digital media (Hargittai 2007; Street 1995; Warschauer 2003), we have been able to create a typology of skills, made up by three distinctive groups:

- *Technical and functional skills* (connected to the use of software and hardware, to the ability to use a web interface, to use search engines, etc.)
- *Consumption skills* (connected to the ability to process information found on the web or content mediated by SNS, such as discerned information sources or the results of a query in a search engine.)
- *Creation and interaction skills* (connected to the ability to create content in a critical way, not just from a technical point of view, such as using Wordpress. Therefore, for example, posting a photo on SNS, evaluating the audience, the exposure of one's own data, etc.).

These different types of groups do not represent a mere simplification of more structured analyses, but attempt to establish a dialogue between careful theoretical distinction and the interviewees' narrations. The aim of this study is not necessarily to evaluate skills, but to better understand how adolescents create, modify, adapt and share these skills among themselves.

The analysis of the interviews allowed us not only to identify these three macro-groups, but also to define how digital literacy circulates (or not) between adolescents and their parents, adolescents and their teachers, and how it circulates in relation to technology. Looking at adolescents' everyday life, the analysis identified four different flows in the circulation of digital skills:

- *parental flow* (involving fathers and mothers);
- *educational flow* (referring to formal education);
- *peer flow* (connected to friends and people of the same age);
- *technological flow* (involving technological devices, such as computers, laptops, smartphones, tablets, etc.).

We adopt this distinction between different flows to show the findings of our research with the main aim of understanding how different skills circulate through these four flow patterns among adolescents and also with the purpose of recognising the existence of a broader system of knowledge circulation influencing digital media adoption.

6. Managing Flows and Circulating Skills

6.1 Peer Flow

According to the analysis, we can distinguish two different peer groups: close peer group and extended peer group (Scarcelli 2015). The first group includes peers that adolescents know in person, while the second group relates to subjects that young people may engage with exclusively through digital media (people that upload a video on YouTube or a tutorial on a website, for example). It is interesting to notice that, when adolescents speak about the extended peer group, the generational barrier crumbles. Even though the person who posts a video tutorial on YouTube or writes a guide on a specific website may be an adult, interviewees consider him/her part of their peer group anyway:

I looked for how to install a game on my computer on a website...
 [Do you remember which one?]
 No, I don't remember... there was a tutorial, because I downloaded the game, it was not original. So I needed to understand how to crack it.
 [Who wrote the guide?]
 A guy...
 [How could you be sure that he was a guy and not a girl or an old man?]
 ... I think he was a guy. Probably he was... Adults don't crack games... They are probably not able to crack them either...
 (Pietro, 16)

In relation to technical-functional skills, a small number of adolescents, mainly males, are used to activating the flow with the extended peer group in order to understand how to fix a problem or how to do a specific task. They prefer to try to find the solutions they need themselves. No one claims to have ever made a tutorial, guide or other content that could help other people on a technical plane. We can define this kind of flow as unidirectional, because it moves only from the extended peer group to the adolescent, without reciprocity. In relation to technical-functional skills, adolescents only activate a bidirectional flow within a small group, composed of boys whom they know in person and who have more advanced skills in assembling and disassembling computers, constructing websites, cracking videogames, etc. Some adolescents who take

part in these kinds of groups told us about an important flow that allows them to learn something new and to improve their skills:

There are three of us. We love to “do experiments” with computers and to program them. Sometimes, we meet at my house or at Carlo’s and try to find a solution together, to fix a problem for example.
(Marco, 17)

Usually, those who have more advanced technical-functional skills become a point of reference for the peer group, who ask them for help when someone needs technical advice. Again, in this case, there is a uni-directional flow. On the one hand, those who ask for help frequently do not care about how to fix that problem in the future, because they know that there is someone who can do it. On the other hand, those who have advanced technical competences can close themselves off, preferring to maintain their position and avoid sharing their knowledge. There is a persistent gender segregation: interviewees speak about a male who has helped them with a computer problem, but never refer to a girl.

Peer flow in relation to content skill is absolutely poor. According to interviewees, for example, it is not necessary to learn how to trust internet contents. This is something that can be understood by simply comparing different sites when in doubt. Usually, interviewees do not know how search engines work and declare that it is a topic they never think about:

I use Google. It gives you the results.

[How is it possible?]

What?

[How does Google work, how can it give you lots of results and why is a specific result the first one?]

Because it is the most correct.

[So, imagine having to explain to me how to carry out research using Internet resources. I have to go into Google, fill in the form and I can use the first result to find what I am looking for?]

Of course...

[And there is no way to be totally sure that the information I find is totally correct?]

Yes... you can open another two or three websites that Google gives you and you can compare those.

(Luisa, 17)

Some interviewees do not know who can publish content on a website either:

[Who puts the information on the website?]

The owner of the website...

[Can anyone write on the Internet?]

No, first of all you have to buy the website... then you can write. But you can't write anything, there are some checks.

(Christian, 16)

Production-interaction skills take part in the peer flow using the peer group as a judge of digital performance, mainly in SNS. In this case, the close peer group becomes an important landmark to understand what kind of behaviour is socially acceptable. We have to remember that, during adolescence, the peer group is very important. On the digital platform as in face-to-face interaction, symbolic sanctions become useful to define the rules of how to interact and to expose oneself through digital media:

You know what is better not to put on Facebook... Photo, video, etc.
[How do you know?]

You know... there isn't anything written anywhere... but you can understand it... There are some things you know that you shouldn't do, like post your naked pictures. Then you know that, for example, when you are on Facebook chat, you shouldn't write a really long message.

[Can you explain? Give me an example.]

[laugh] Some months ago, I wrote a message to a friend and I wrote something really long... she took a screenshot and put it on her Facebook page, writing something like "When you wait for five minutes for your friend's response and then you understand why... Please Paola, take a breath!" She was not being rude, it was just a joke, but I understand... Then there are people that write phrases with just four words and then press enter [laugh]

(Paola, 16)

Sometimes, in the peer group, stories of "wrong behaviour" circulate, which both define normal behaviours in the use of digital resources and compose shared rules. It is a plot outline that adolescents frequently repeated during the interview, changing only the subject of the story, who is usually someone that the interviewees do not know directly:

There are some things that it's best you don't do.

[Like what?]

For example, send a video or a photo without clothes to someone... because then everyone knows you intimately [laugh]. It happened to a girl from Padova. Everyone has her video [laugh]. She doesn't live in Padova anymore... she had to go abroad because everyone knew her and her video...

(Gianni, 17)

Peer flow, with the differences that we explain, remains an important flow for adolescents who, except for the content skill, continue to refer to the peer group (mediated and not mediated) as an important source for their behaviour.

6.2 Parental Flow

Another flow to emerge from the analysis of the interviews was the *pa-*

rental flow, which is connected to familial relationships and the way these intersect with the circulation of competences and skills related to the Internet. The research shows that it is a flow commonly neglected by the adolescent. The research underscores the persistence of generational distance between young people and adults, which is based mainly on the idea from both sides that digital media, especially social media, is something aimed solely at young people. In general, adolescents regard adults, specifically parents and teachers, as unable to use digital technology at all. This attitude is particularly prevalent when adolescents refer to their mothers, who were considered to be the most technically un-equipped member of the family by the interviewees. The discourse focuses more on the technical aspect than on the other uses of digital media:

If you look at people like my mother, you can see that they are unable to use a computer, smartphone, etc.

[What you mean when you say “unable”?]

Someone has to stop them using the computer [laugh]. My mum asks for help every five minutes. She can't use a smartphone, she doesn't know how to send messages! Do you understand?

(Michele, 16)

The parental flow seems to be unidirectional: adolescents could teach their parents how to use digital media in relation to technical skills, but they rarely ask their mother or father to help them. The exception is represented by the request to solve a technical problem connected to malfunctioning, which requires the intervention of an expert. In this case, we cannot speak about the circulation of knowledge, because the flow stops at the request. There is a gender difference in situations like this. Girls refer to their father, because they consider him to be capable of eventually finding a technical solution. In this case, we cannot refer to a fallacious flow, because there is no sharing of knowledge and girls close the flow, because they do not care. Some boys prefer to request help only if they are not able to fix the problem themselves; however, they do not ask their parent to fix it, but call a technician who is able to solve that problem. Thus, it is a financial more than a technical request. However, some of them are attracted by the knowledge of technicians:

In my home, I am the technician. I fix computers, my parents' phones, I explain to them how to use software, etc. If it is outside my knowledge, I ask my father.

[Is he able to fix technological devices?]

Obviously not! But he has money to call the professional technician. I liked it when he came to fix the computer at home, because I observed him and I learnt something new. At a certain point, he started to ask us to bring the computer to his laboratory... in my opinion, he doesn't want me to learn more things, because he was afraid of losing a client.

(Marco, 17)

As in the peer flow, we notice that some interviewees look at technical knowledge as a set of skills that could remain hidden and not accessible to everybody. In the rhetoric of Marco, for example, the idea that the technician would avoid fixing the computer in his own home is connected exactly with an imagined idea where technical knowledge has to be protected within the walls of labs. Only in a few cases do the adolescents seem to activate a flow of knowledge connected to the content of digital media. The interviewees that we can include in this group belong to families with high cultural capital:

Sometimes, I ask my mother for some suggestions when I look for information on the Internet or we speak about where to find good news.

[What do you mean by “good news”?]

News that is true. My mum explains the more important news sites to me, such as Repubblica.it, Corriere.it. Sometimes I ask her to help me to understand if a news story is false.

[How does she help you?]

We check together on different sites, she knows the information world better.

(Piera, 17)

In this case, parents are useful to mediate the content connected to school (research, information, news, etc.) but not connected to the sphere related to the creation of UGC that remains private and, according to the interviewees, has to be kept separate from parents.

6.3. Educational Flow

According to our analysis, adolescents are inclined to keep the flow connected to school closed too. This happens principally because the idea of the “adult as not competent” in relation to technology persists. In this case, one of the most recurring examples used by young people is related to the electronic grade book:

Have you ever seen a teacher? When they open the electronic grade book? Or better, I have to say, when they try to use it [laugh]. My History teacher spends half an hour opening it and filling it in! It is not a problem for us, obviously! [laugh]

(Massimo, 17)

According to interviewees, the scholastic curriculum does not permit them to gain the knowledge needed for life in the information society¹.

1 As we are analysing the circulation of knowledge connected to digital skills, we will not go into depth in relation to what adolescents ask to learn about digital media. Briefly, we can say that the majority of interviewees declare that they would prefer their school to teach them how to defend themselves from external

The flow of knowledge is activated only in relation to technical-functional skills. It happens only during specific classes: computer science, technical education, and/or other classes into which a specific module is inserted on the use of particular software. Those who attend technical school obviously dedicate more time to the study of programming or technical issues. However, with different levels of attention related to the kind of school, the scholastic curriculum usually seems to focus on what we define as technical and functional skills:

I am studying to become a programmer... They teach me to use software and to construct software, computer languages to program, etc.

[Do you ever speak about other things, such as social network sites?]

No, never... maybe they say "Facebook" to give an example of an application that we can create, but no more.

(Federico, 16)

Trying to improve consumption-interaction skills seems to be a prerogative of some professors teaching Italian or History, who might talk about a news source and the Internet. However, it is a rare occasion, according to what interviewees claim:

We never speak about computers or the Internet during class... just when we have to use Excel. Or a few years ago, Prof. *** [surname of the teacher] did a lesson about the difference between the newspaper and news sites. But just one lesson. It was interesting... I don't remember anything. [laugh]

[What did Prof. *** teach?]

Italian.

(Giuseppe, 16)

Regarding creation skills and discourses connected to them, adolescents describe school as a static reality. Formal education does not seem to deem dealing with the experiences of youth (how they use digital media to interact or to communicate) as important. Therefore, it is limited to the teacher's judgement whether these issues are discussed, usually in the form of commentary on news underlining the risks of the Internet or digital media, in general.

Sometimes, interviewees report that this task has been carried out by an external expert within a short project on media education. Teachers barely speak about the digital media dealing with social aspects; more frequently, they remain in the educational and normative sphere:

Do you know about the girl that killed herself near here, in Cittadella?

[Yes, I know.]

attack rather than from problems related to the sharing of personal data, always on a technical level (use of anti-virus, anti-malware, etc.).

Last year, the teacher spoke to us about what happened and asked us if we were using ask.fm. She said that it is not good to be anonymous, to offend people, etc.

[And you? What did you do?]

We listened to her... someone tried to say that that girl probably had problems, but she said that the problem was that some people are able to speak with each other anonymously... behind the monitor...

(Carlo, 17)

In general, interviews define the school flow as unidirectional. When we spoke about parental flow, we described this characteristic as something that “pulls” the knowledge from the adolescents to the parents. For school flow, the direction is inverted and goes from teachers to students, following the traditional vertical socialisation process.

6.4. Technological Flow

Interviewees rarely refer to technological flow in their narrations. Regardless, it is important to mention what research allows us to notice, because, for the process of improving skills, this flow has an important role. As we note, the different flows that we describe are frequently weak and adolescents improve their digital media related skills through a trial-and-error process. Technological flow involves mainly technical-instrumental skills and creation-interaction skills.

When the interviewees spoke about digital media and the interfaces they use daily, they take for granted that they are able to use them, just because they are able to use these kinds of technology on a technical-functional level. It is important to consider two different aspects: the first represents a platform created by a company, where the operations of the user are limited, whereas the second is constituted by the possibility for the user to modify some parameters. At the first level, one finds an extremely user-friendly interface, which teaches the user how to use that platform in a unidirectional flow following the interface guidelines. In this case, adolescents seem to easily understand how to use applications or interfaces as they present themselves to the user. The second level seems to be neglected by adolescents, who frequently look at it as something for experts. One of the more explicit examples could be one connected to the privacy settings of social media. In this case, we can refer to Facebook, which allows the user to modify their privacy settings and to manage who can see what on their profile. Although they understand the intuitive actions that the platform takes on their profile page, the interviewees become lost when we talk about configuration settings:

[Do you know that there is a specific section of the Facebook website where you can change your privacy settings?]

Yes I know...

[Do you ever change it?]

No... it is difficult. I just “close” my page so strangers can't see my stuff, but that's all. The other settings are probably for the people that know Facebook really well.

[For example?]

The programmer.

(Enrico, 17)

The majority of interviewees claimed to prefer finding alternative solutions and to change their choice rather than change the setting of their SNS or other applications. Frequently, they consider technology as something static and so prefer to modify their behaviour. For example, adolescents usually do not create a specific list of friends on Facebook with which they share certain content. Instead, they prefer to write a post using a sub-code that only those aware of it can fully understand:

If I do not want some of my Facebook friends to have access to a particular image, I simply do not post it on Facebook.

[Do you know that you can decide who can have access to certain content on your Facebook profile?]

Yes I know, you can change the settings where there is the small wheel. But it is easier to decide what you want to post.

[And what if someone posted that photo on your profile?]

I'd kill him [laugh]

(Giulia, 18)

The technological flow is the one that can best explain how technology and society are co-constructed and how users readapt the established technical uses, re-shaping them according to their necessity. This kind of flow explains that technology and users are two spheres that we need to consider as entangled rather than separated (Oudshoorn and Pinch 2003).

7. Conclusion: Bricoleurs at Work

The analysis showed that adolescents' interpretation of their relationship with technology still is largely overflowing with technological determinism. Interviewees described a stereotypical image of technology as a field dedicated to specific social actors, typically young teenage boys. Young people's accounts reveal a *fil rouge* that insists on a specific definition of competences, framing them mainly within a technical domain. Moreover, adolescents' discourse marks a symbolic generational frontier between adults and adolescents, in which digital media represent the wall that divides the two groups. This symbolic separation defines the flows that we called *parental* and *educational*, which are mainly unidirectional and do not permit the spread or sharing of technical and social skills useful for life in information society.

On the one hand, the educational flow concentrates only on technical and functional skills and frequently considers a vertical transmission of knowledge based on formal education. Italian schools are still unprepared for the new challenges that digital media present (Calvani 2010) and adults' and adolescents' competences rarely merge in an educational flow. On the other hand, the process seems to be inverted for the parental flow. It is also based only on technical and functional skills, but envisages a transmission that goes from the adolescent to their parents. The symbolic separation between adults and young people could be functional for adolescents seeking spaces of autonomy (boyd 2014). However, it shows a broad gap, unable to consider the social side of digital media and its role in the life of the adolescent.

According to our analysis and in line with the studies discussed in the first part of the article (Hargittai 2007; Street 1995; Warschauer 2003), adolescents define, redefine, modify and improve their knowledge of digital media, mainly by direct experience and within the peer group. Technological flow, even if not explicitly mentioned by the interviewee, plays an important part in adolescents' experiences. They are, on the one hand, modelled by technology and, on the other hand, they redefine the technology itself. The technological flow shows explicitly one of the recurrent topics in STS and media studies: the mutual co-construction of technology and society that, as in the SCOT (Pinch and Bijker 1984) and the domestication approaches (Silverstone and Hirsh 1992), puts emphasis on user-technology relations. In the case of the technological flow, we find a clear example of how users shape and negotiate meanings and practices in technology use. Focusing on adolescent skills, we can see that adolescents deploy different skills every day in conjunction with technology, which allow them to participate in a rich way in the today's information society. Adolescents' experiences with digital media are based on a trial-and-error attitude, which still seems to be the most important way to acquire skills. Every day, scripts and instructions embodied by technology are reshaped and adapted by adolescents for their needs, especially in the case of technical-instrumental skills and creation-interaction skills. Some problems related to creation-interaction skills could emerge, as the adolescents' interviews showed little concern when using digital media to manage social interactions or self-presentation. Young people frequently tend to take the operation of digital media for granted. In this case, technology seems to be interpreted as too difficult to understand and so it is frequently considered as more rigid and difficult to adapt to specific needs. Rather than using technology and setting it to respond to their everyday needs, adolescents prefer to adapt their aims, finding alternative ways to communicate on the platform. In this case, the technological flow does not contribute to fostering skills and the adolescents prefer to reshape their activities rather than technology.

Even in this case, adolescents tend to interpret as the technical and the social as separate domains. The latter emerge when we consider the

peer flow, which mainly concerns the performance of adolescents through SNS and face-to-face communication. Comments, jokes, teasing, etc. function as activities that define the rules concerning how to interact and to expose oneself through digital media. This kind of flow remains within the peer group and extended peer group (Scarcelli 2014), establishing a common knowledge that becomes part of peer culture.

Far from confirming a deterministic image of media-competent adolescents, our analysis allows the figure of the *bricoleur* (Drusian and Riva 2010) to emerge. Adolescents use their own cultural and social instruments to combine different flows of circulation of competences and to create their own toolkits for using digital media. Taking into account the different flows that we described and the variety of skills necessary for life in an information society, our study looked closely at the relationship between technology and society as part of domestication theory and the social shaping of technology approach. Once again, contrary to the point of view offered by deterministic perspectives on media diffusion (the most cited example is the label “digital natives” – Prensky, 2001), we can define the sociotechnical construction of competences as something far from being naturally embodied in adolescents. The four flows that we described help to reveal how the circulation of competences is constructed in social context and interaction. As we have shown, the relevance of the competences’ circulation does not seem to have been interiorised and accepted, neither in public debate nor from the adolescent point of view. The persistence of a view that considers digital media as a foreign entity, either in school or in the family, and the idealised separation between online and offline experiences, both increase the divide between generations and reduce knowledge flow that adolescents would understand.

By using the concept of social literacy and focusing not only on how adolescents use technology, but also on the circulation of competences, one might gain a better understanding of the processes of appropriation and use of digital media among young people. Research frequently focuses on the measurement of skills and institutional offers that permit adolescents to potentiate their competences. The four distinctive flows we described in this article could be relevant to better understand the circulation of competences involving young people, in processes where they are actors with agency, able to interact with other human and non-human actors. According to Lievrouw (2014), analytically combining tools from STS and media studies could be a fruitful way to embrace a more nuanced analysis, able to examine the circulation of competence in relation to all actors involved. It could be useful to bridge the gap between the technical and social, in public discourse, in educational practices and in everyday life experience, in order to build a clearer assessment of the different flows of competence relevant in new media use. This would reinforce the digital literacy of adolescents and help young people to compile the resources necessary to actively take part in information society. However, understanding the gaps in such flows does not mean to trace a nor-

mative path based on an adult perspective, but to give relevance to the *bricoleur* work of adolescents. It should be a co-constructive process, where the knowledge of both adults and adolescents can merge, maintaining their own specificity. In this way, social and technical expertise could converge and start to respond to the new challenges of today's information society.

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References

- Aufderheide, P. (1993) *Media Literacy: A Report of The National Leadership Conference on Media Literacy*, Aspen, Aspen Institute.
- Barton, D., Hamilton, M. and Ivanic, R. (2000) *Situated Literacies: Reading and Writing in Context*, London, Routledge.
- Bennett, S., Maton, K. and Kervin, L. (2008) *The "Digital Natives" Debate: A Critical Review of Evidence*, in "British Journal of Educational Technology", 39 (5), pp. 775-86.
- Bertot, J.C. (2003) *The Multiple Dimensions of the Digital Divide: More than the Technology "Haves" and "Have Nots"*, in "Government Information Quarterly", 20 (2), pp. 185-191.
- Bimber, B. (2000) *The Gender Gap on the Internet*, in "Social Science Quarterly", 81, pp. 868-876.
- Bolt, D. and Crawford, R. (2000) *Digital Divide: Computer and Our Children's Future*, New York, TV Books.
- boyd, d. (2014) *It's Complicated*, New Haven Yale, University Press.
- Buckingham, D. (2007) *Beyond Technology. Children's Learning in the Age of Digital Culture*, Cambridge, Polity.
- Buckingham, D. (ed.) (2008) *Youth, Identity, and Digital Media*, Cambridge, The MIT Press.
- Calvani, A. (2010) *Dove va la Media Education? Riflessioni sull'identità della ME nella società contemporanea*, in "Media Education", 1 (1), pp. 13-25.
- Caputo, V. (1995) *Anthropology's Silent 'Others'. A Consideration on Some Conceptual and Methodological Issues for the Study of Youth and Children Cultures*, in V. Amit-Talai and H. Wulff (eds.), *Youth Cultures. A Cross-Cultural Perspective*, London, Routledge, pp. 19-42.
- Di Maggio, P. and Hargittai, E. (2001) *From the 'Digital Divide' to 'Digital Ine-*

- quality': *Studying Internet Use as Penetration Increases*, Princeton, Center for Arts and Cultural Policy Studies, Woodrow Wilson School, Princeton University.
- Drusian, M. and Riva, C. (ed.) (2010) *Bricoleur High Tech. I giovani e le nuove forme della comunicazione*, Milano, Guerini.
- Flick, U. (1998) *An Introduction to Qualitative Research*, London, Sage.
- Gui, M. and Argentin, G. (2011), *Digital Skills of Internet Natives: Different Forms of Digital Literacy in a Random Sample of Northern Italian High School Students*, in "New Media & Society", 13 (6), pp. 963-980.
- Gunkel, D. (2003), *Second Thoughts: Toward a Critique of the Digital Divide*, in "New Media & Society", 5 (4), pp. 499-522.
- Hargittai, E. (2002) *Second Level Digital Divide: Differences in People's Online Skills*, in "First Monday", 7 (4), <http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/942/864>.
- Hargittai, E. (2007) *A Framework for Studying Differences in People's Digital Media Uses*, in N. Kutscher and H.-U. Otto (eds.), *Cyberworld Unlimited*, VS Verlag für Sozialwissenschaften/GWV Fachverlage GmbH, pp. 121-137.
- Hargittai, E. (2010) *Digital Na(t)ives? Variation in Internet Skills and Uses among Members of the "Net Generation"*, in "Sociological Inquiry", 80 (1), pp. 92-113.
- Helsper, E.J. and Eynon, R. (2010) *Digital Natives: Where Is the Evidence?*, in "British Educational Research Journal", 36 (3), pp. 503-520.
- Jenkins, H. (2006) *Convergence Culture: Where Old and New Media Collide*, New York, University press.
- Le Boterf, G. (2000) *Construire les compétences individuelles et collectives*, Paris, Les Editions Eyrolles.
- Lievrouw, L. (2014) *Materiality and Media in Communication and Technology Studies: An Unfinished Project*, in T. Gillespie, P.J. Boczkowski, K.A. Foot (eds.), *Media Technologies: Essays on Communication, Materiality, and Society*, pp. 21-51.
- Liff, S. and Shepherd, A. (2004) *An Evolving Gender Digital Divide?*, in "Oxford Internet Institute, Internet Issue Brief", 2, www.oii.ox.ac.uk/resources/publications/IB2all.pdf
- Livingstone, S. (2009) *Children and the Internet. Great Expectations, Challenging Realities*, Cambridge, Polity Press.
- Livingstone, S., Haddon, L., Görzig, A. and Ólafsson, K. (2011) *Risks and safety on the internet: The UK Report*. LSE, London: EU Kids Online.
- Livingstone, S., Haddon, L., Vincent, J., Mascheroni, G. and Ólafsson K. (2014) *Net Children Go Mobile: The UK Report*, London, London School of Economics and Political Science.
- Magaudda, P. (2011) *When Materiality 'Bites Back': Digital Music Consumption*

- Practices in the Age of Dematerialization*, in "Journal of Consumer Culture", 11 (1), 15-36.
- Mascheroni, G. (2012) *Competenze online e digital literacy*, in G. Mascheroni (ed.), *I ragazzi e la rete. La ricerca EU Kids Online e il caso Italia*, Brescia, La Scuola, pp. 89-110.
- Norris, P. (2001) *Digital Divide? Civic Engagement, Information Poverty and the Internet in Democratic Societies*, Cambridge, Cambridge University Press.
- Oudshoorn, N. and Pinch, T.J. (2003) *Introduction. How User and no-User Matter*, in N. Oudshoorn and T.J. Pinch (eds.), *How User Matter. The Co-Construction of Users and Technologies*, New Baskerville, The MIT Press.
- Pinch, T. and Bijker, W. (1984) *The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit From Each Other*, in "Social Studies of Science", 14 (3), pp. 399-411.
- Prensky, M. (2001) *Digital Natives, Digital Immigrants*, in "On the Horizon", 9, 5, pp. 1-6
- Riessman, C. (2002) *Analysis of Personal Narratives*, in J.F. Gubrium and A. Holstein (eds.), *Handbook of Interview Research: Context and Method*, London, Sage, pp. 695-710.
- Riva, C. and Cefalo, R. (2014) *Media Consumption and the Processes of Recognition Among Young People*, in "Italian Journal of Sociology of Education", 6 (3), pp. 104-129.
- Scarcelli, C.M. (2014) *"One Way or Another I Need to Learn This Stuff!" Adolescents, Sexual Information, and the Internet's Role Between Family, School, and Peer Group*, in "Interdisciplinary Journal of Family Studies", 19 (1), pp. 40-59.
- Scarcelli, C.M. (2015) *"It is disgusting, but...": Adolescent Girls' Relationship to Internet Pornography as Gender Performance*, in "Porn Studies", 2 (2-3), pp. 237-249.
- Silverstone, R. and Hirsch, E. (1992) *Consuming Technologies, Media and Information in Domestic Space*, London, Routledge.
- Sonck, N., Nikken, P. and de Haan, J. (2013) *Determinants of Internet Mediation*, in "Journal of Children and Media", 7 (1), pp. 96-113.
- Street, B. (1995) *Social Literacies. Critical Approaches to Literacy in Development, Ethnography and Education*, London, Longman.
- Tapscott, D. (1998) *Growing Up Digital*, New York, McGraw-Hill.
- Van Deursen, A. and Van Dijk, J. (2011) *Internet Skills and the Digital Divide*, in "New Media & Society", 13 (6), pp. 893-911.
- Van Dijk, J. (2005) *The Deepening Divide: Inequality in the Information Society*, Thousand Oaks, Sage.
- Warschauer, M. (2003) *Technology and Social Inclusion: Rethinking the Digital Divide*, Cambridge, MIT Press.
- Winner, L. (1980) *Do Artefacts Have Politics?*, in "Daedalus", 109 (1), pp. 121-136.