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Screencasting Information Literacy. Insights in pre-service teachers' conception of online search.

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Screencasting Information Literacy. Insights in pre-service teachers' conception of online search.[1]

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Abstract. Information Literacy (IL) has been named a key competence for the twenty-first century and is being progressively introduced in many compulsory school curricula. Nonetheless, the actual implementation of effective IL education cannot be carried out without the sound preparation of teachers. This study explores the naïve, pre-instruction conceptions of online information search of pre-service pre-primary and primary teachers through the structured qualitative analysis of participant-produced screencasts. The results indicate that teachers have a mainly technical view of IL, leading to focus on basic computer literacy skills (e.g., how to use a search engine) and to overlook mental processes (e.g., definition of the information need or strategy). Implications for the development of pre-service teachers IL education are discussed.

Keywords. Information Literacy, pre-service teachers, teacher education, search behavior, screencast

Information Literacy and online search

Information Literacy and digital citizenship

Over the last few decades, digital technologies have allowed each of us to potentially find information about everything from everywhere in a matter of seconds. On the one hand, this has made the world smaller; on the other, we are now learning to swim in an overwhelming ocean of information. Today the internet is an open information space with over 5 billion users and almost 2 billion websites – including small personal blogs and huge hubs like Wikipedia or Amazon; Google serves about 3 billion searches a day (Internetlivestats, n.d.), YouTube creators share about 720'000 hours of video every day (Mohsin, 2021); contributors to the English version of Wikipedia make 2 edits per second, and the largest online encyclopedia grows on average of about 598 articles every 24h (Wikipedia, n.d.); each day more than 100 billion messages are sent on WhatsApp (Dean, 2021).

If these are just some of the figures that describe our interconnected world, being information literate is clearly a key challenge for today's citizens: effectively and efficiently retrieve information, behaving ethically, and critically evaluating the sources are paramount in order to actively participate in our society (Information Literacy Meeting of Experts, 2003; Johnston & Webber, 2003) and are fundamental in a democratic society (White, 2016) in which citizens are called to share responsibilities in collective choices for the common good. The Covid-19 pandemic and the related infodemic (Zarocostas, 2020), and the current war in Ukraine provide a wealth of examples.

Information literacy (IL) is actually included among the century critical skills (Ananiadou & Claro, 2009), and all current Digital and Media Literacy models (such as DigComp 2.1, Carretero, Vourikari & Punie, 2017; see also Hobbs, 2010; JISC, 2014) include IL, which is regarded as a central element in school education (Bucher, 2000); indeed, today IL is included in many European compulsory education school curricula (Guitert, Romeu & Baztàn, 2017). Kurbanoglu (2013) emphasized its foundational role as enabler of life-long learning efforts.

Like for any content and competence, however, schools will be able to help students develop IL skills only as long as teachers develop a clear understanding of the actual content and skills of IL

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and of how they can teach it (Asselin & Lee, 2002). Of course, teacher education institutions play a key role in preparing pre-service teachers for the task (Earp, 2009; Pinto et al., 2019; Wu et al., 2022), which entails both developing their own IL skills and the ability to teach IL to their pupils (Klebansky & Fraser, 2013; Kovalik et al., 2011).

Exploring IL

Starting from its first definition by Zurkovsky in 1974, the concept of Information Literacy (IL) has been progressively redefined to cope with social and technological developments. For example, already in the '80s, Aufderheide (1983) emphasized the ability to locate, access and use information from different media. The spread of the internet as an everyday commodity made the issue more urgent (Livingstone, 2004): the very concept of *literacy* had to be adapted to a varied, moving, transversal and multiform information landscape (Leu, Kinzer, Coiro & Cammack, 2004; Coiro, Knobel, Lankshear & Leu, 2014). Such a movement influenced the attempts to define the content of IL.

Already in 1998, the American Association of School Librarians and Association for Educational Communications and Technology formulated a set of IL standards, which set a first milestone which provided a basis for further developments – for example the 7 pillars of IL (*identify, scope, plan, gather, evaluate, manage, present*; Bent & Stubbings, 2011), which are a cyclic process which may vary depending on the age and context of the learner. Each pillar includes a set of understandings and skills, which can be developed simultaneously or independently, and whose acquisition allows the individual to move towards the top of the pillars.

The framework provided by the ACRL (2015) aims to expand the concept of IL by relying heavily on the concept of metaliteracy, i.e., a more self-critical and reflective approach which conceive IL as a set of comprehensive and overarching skills that accompany learners throughout all learning activities. In this sense, IL skills allow them not only to locate, use and evaluate information but also to produce new knowledge and actively participate in the learning community. The result is a framework of interrelated concepts, flexible, dynamic, and adaptable to different contexts, rather than a prescriptive standard. Six frames analyze fundamental information literacy concepts, from which a set of practices and dispositions emerge.

A more recent study (Wineburg & McGrew, 2017) shed new light on IL by comparing the practices of professional fact checkers, historians and university students, and introduces three concepts*: taking bearings*, *lateral reading* and *click restraint*, which are common to the research practices of professional fact checkers. *Taking bearings* on the web means acquiring a sense of direction: before plunging into an unknown topic, one must first orient oneself and elaborate a strategy. This moment of orientation often turns into the practice of *lateral reading*, as opposed to full vertical reading: lateral reading consists of taking a quick look at the selected source and then leaving the site, opening up new tabs to look for confirmation elsewhere. Fact checkers do not evaluate the source by studying it closely and vertically, but by opening up new pages about it: in doing so, they use the appropriate keywords, scroll through results and read the snippets (*click restraint*) before going back to the source.

Lateral reading (Brodsky et al, 2021a; Brodsky et al, 2021b) is also the core concept behind SIFT (Caulfield, n.d). SIFT stands for *Stop, Investigate the source, Find better coverage, and Trace claims, quotes, and media to the original context* and provides a four stages strategy to determine the quality of sources. Caulfield's model paradoxically implies that in order to ascertain the quality of a source, one should leave it and verify elsewhere.

The Big6 as a practice-oriented model for IL education

For this study, we used the Big6 model (Big6, n.d.; Eisenberg & Berkovitz, 1999) to operationalize the IL construct. Big6 is targeted to K-12 teachers, is practice oriented, is known to many teachers, and has been assessed through small scale international research and classroom-based studies in compulsory education (Wolf, Brush & Saye, 2003; Baji, Bigdeli, Parsa & Haeusler, 2018; Gekara, Namande & Makiya,2021; Iriani & Wicaksono, 2021; Jeyshankar & Nachiappan, 2021) and in

higher grades (Santana Arroyo, 2013). The Big6 model describes IL as the ability to find, process and use information effectively.

The model traces and highlights the six stages that people go through during every information problem-solving process (see Figure 1):

1. The *Task Definition* stage involves defining the assignment and circumscribing / bordering the essential question in order to identify the type of information needed.
2. The *Information Seeking Strategies* step includes the identification of the possible sources useful for solving the problem, their selection and ranking.
3. The *Location and Access* stage corresponds to the question "how will I find and access the best sources?" and concerns the theoretical and practical access to the source.
4. Once the source is located, one should interact with it to understand what information is relevant and to decide how to extract it; this is the *Use of Information* step and it involves reading, listening and viewing.
5. During the *Synthesis* stage, the information needed must be reworked and processed: this step entails the decision about which type of presentation and format is most appropriate to display the information in accordance with the assignment.
6. The *Evaluation* stage involves self-assessment and determines effectiveness of the result and efficiency of the problem-solving process.

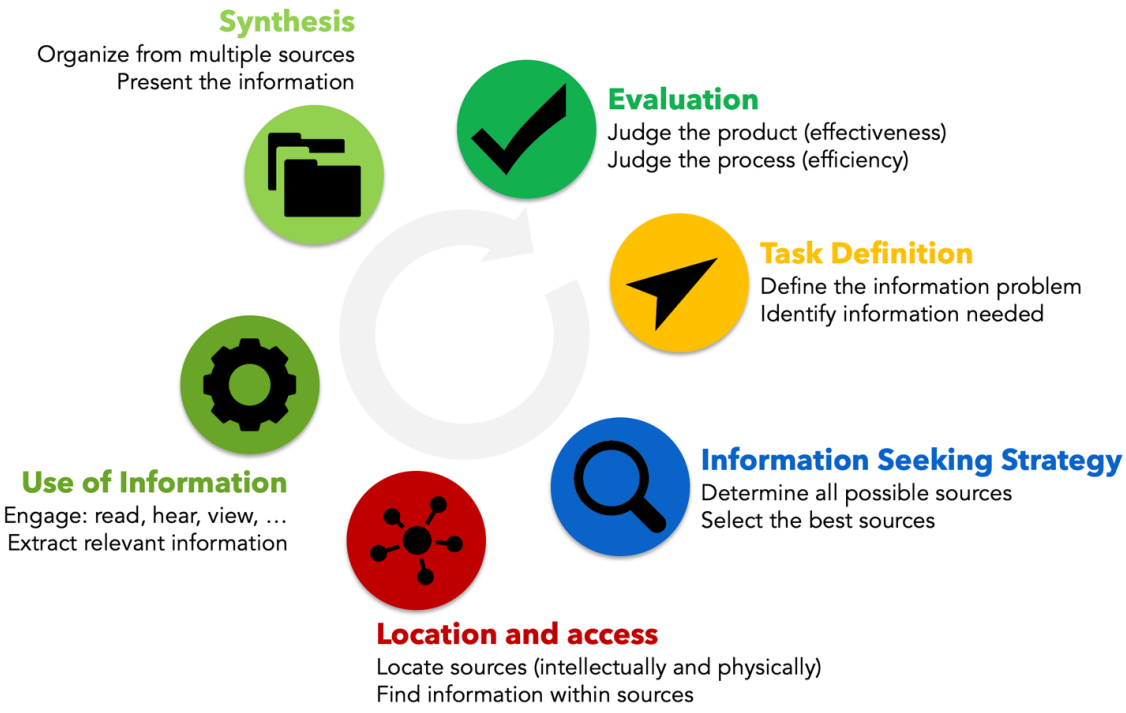

Figure 1. the Big6 model (adapted from Big6, n.d.)

Information Literacy and pre-service teachers

A prerequisite for the effective integration of IL in the school curriculum is equipping in-service and pre-service teachers with proficient IL competences. Such education should be informed by evidence about teachers' pre-instructional conception of information search. To this purpose we decided to investigate primary and pre-primary pre-service teachers' conceptions of how to conduct an online search in the context of Italian-speaking Switzerland.

Awareness of the importance of IL preparation for teachers is generally widespread. Already in 1989, the American Library Association (ALA) Presidential Committee on Information Literacy highlighted the need to promote the critical skills of future teachers and recommended the enhancement of IL skills in teacher education programs. Nonetheless, ten years later, Carr (1998)

pointed out that, despite declarations of intent about the importance of IL in teaching and learning processes, the integration of IL in teachers' preparation was yet to be adequately implemented. Things seemed to improve in the following years, but Duke and Ward's meta-analysis of the literature on information literacy in teacher education (2009) shows that even if teacher education programs have made good progress, much remains to be done. Information literacy education for teachers is today an open challenge (Duffin, Ziebarth-Bovill & Reeves, 2021).

Most studies collect evidence to assess pre-service teachers' IL skills through questionnaires. Their results indicate that pre-service teachers do perceive the importance of helping students become information literate, but do not feel they have the necessary preparation to do so (Asselin & Lee, 2002; Collin, 2014; Ruppel, Winstead Fry & Bentahar, 2016). For example, Stockham and Collins (2012), who surveyed 70 pre-service K-12 teachers of two courses at the University of Kansas, found out that only 10% of them were familiar with the basic concepts of IL, such as the Big6 model. Lee, Reed and Laverty (2012) provide additional evidence: a survey administered to more than 500 pre-service teachers indicates that most future teachers feel inadequately prepared to teach IL skills and stresses the insufficient IL integration in their undergraduate program.

Paradoxically, despite not being familiar with IL-specific terminology, some teachers seem to be overconfident in their own IL competencies, even when faced with poor results in IL tests (Shannon, Reilly & Bates, 2019). Godbey (2018), using a 60-minute test composed of 14 scenario-based information tasks, corroborated such evidence, pointing to a lack of IL skills in pre-service teachers.

Several studies aim to assess the impact of initiatives for the integration of IL in pre-service teacher education, often with a pre-/post-test design. While results are encouraging even for small interventions (Emmons et al., 2009), some researchers suggest that a broader impact would be achieved if IL instruction were integrated in all coursework, and not being limited to single sessions (Ruppel, Winstead Fry & Bentahar, 2016).

While the usefulness of a set of practical and theoretical IL indications is recognized, the collaboration between librarians and teacher educators plays a core role in promoting pre-service teachers' IL, to consolidate both the IL skills and pedagogical approach that future teachers will use to teach IL in their classes (Asselin, Lee, 2002; Lee, Reed, Laverty, 2012; Emmons et al., 2009; Kovalik et al., 2011). Finally, some projects focus not only on pre-service and in-service teacher education, but also on education faculty training (Earp, 2009) as a key element towards the progressive integration of IL in teacher education.

Methodology

Research questions

This study explores the naïve, pre-instruction concept of online search of pre-service teachers, and is structured around the following research questions:

1. What concept of online search do pre-service teachers demonstrate?
2. What type of search instruments do pre-service teachers use?
3. What type of digital documents do pre-service teachers consider? How do they assess their quality or credibility?

Participants

This study was conducted in Canton Ticino, which is the only completely Italian-speaking canton in Switzerland. 92 pre-primary and primary pre-service teachers, selected by convenience and enrolled in the second year of a Bachelor (undergraduate) program at an Italian-speaking University of Teacher Education in Southern Switzerland, participated in this study.

At the time of the data collection, IL did not formally appear in the compulsory school curriculum, except on the "general topic" *Technologies and media*, that mentions "searching for information on books and websites" as examples of life situations that could be analyzed and discussed in class

(DECS, 2015, p. 45). In this school curriculum, a general topic is a content domain to which all disciplines should contribute, but that would not be considered in any assessment.

The previous primary and secondary school curriculum, which was published in 1984 and was valid when most of the pre-service teachers that participated in this study attended school, did not mention IL at all. Given that it is not part of any discipline in the school curriculum, IL is also not included in the 3-year bachelor program for pre-service primary and pre-primary teachers, not even as an optional course. It is therefore fair to assume that most participants did not receive any formal instruction on IL during their previous schooling, if not for the personal initiative of some teacher. The participants were not familiar with IL concepts and definition and with the Bi6 model. Moreover, they did not think of IL as something they would have to teach, i.e., as a relevant subject matter.

The study also aimed to indirectly collect evidence to support the inclusion of IL in the pre-service teacher education curriculum.

Screencast data

The data collection for this study took place in the context of a Bachelor course on Educational Technologies. A unit about instructional video included an online self-learning activity about producing screencasts with Screencast-o-matic or Loom. As assignment for that unit students had to create a screencast video tutorial about online information search:

> *"Your goal is to develop a short video tutorial in which you demonstrate how to search for information online about a topic of your choice. Show how you perform the search and how you decide on which results you click. Visit at least three results and make a brief comment on each webpage.*
>
> *The expected length of the video-tutorial should be between 1 and 3 minutes; it should have an audio commentary and it may have background music. You can decide if you want to appear in the video (with a PiP) or not.*
>
> *When you are done, upload your screencast with the homework tool on this page."*

Screencasts (i.e., videos produced by recording the author's screen, in most cases with an audio commentary) are a very common genre of online video, and are used in education both as instructional videos (Snyder, Paska & Besozzi, 2014; Lloyd & Robertson, 2012; Razak & Ali, 2016) and as feedback instrument in several disciplines (Mathieson, 2012; Cheng & Li, 2020; Cutting & Larkin, 2021; Babula & Kay, 2021), and also for tutorials, e.g., for library search (Steger & Kizilhan, 2021).

Teachers engaged in the creation of an instructional video are applying their professional skills to reflect on information searches: selecting what is relevant, finding appropriate examples and counterexamples, and presenting the related key skills and practices in a clear and convincing manner. Moreover, teachers are aware of their role in modeling complex skills for their pupils (Olson, 1970).

In the context of the course, students were assessed only on the *format and technical quality* of the screencast (including structure, quality of audio, quality of video, edits, etc.); in this study we considered the *content* screencasts as a teaching material eliciting the participants' concept of IL (Smajic, 2018; Kater-Wettstädt, 2018), as different from assessing their IL skills.

The assignment was purposely very open: its goal was to communicate (a) the formal features of the expected output, such as length, use of PiP, music, etc.; and (b) a minimal description of the structure of the content: a topic of choice, how the search is performed, how decisions on what sites to visit are made, and presenting at least three documents. The idea was that the assignment should not provide guidance about how to structure the search itself, and for this reason it does not mention any Big6 element nor specific search instruments. Setting online search as a topic for the screencast was an opportunity for having

the students reflect on IL; nonetheless, as mentioned above, the quality of their search was not subject to assessment, which was limited to the formal features of the screencast.

Dataset and coding

The resulting dataset is composed of 89 student-generated screencasts, as two students did not complete the assignment and one screencast was off-topic, presenting instructions to install a video game.

The screencasts were coded by the two authors of this paper. As a first step, we took some time to freely view the screencasts in order to get familiar with the dataset. Two screencasts were selected as examples to apply a first version of the coding scheme. In particular, section 1 (Screencast data) and section 2 (Big6 elements) were defined *a priori*, while section 3 (Web documents) was discussed, adapted and refined based on what was actually found in the screencasts.

The resulting coding scheme is presented in Table 1, where the *Operational Definition* column provides the definition used to classify screencasts according to each individual item.

Table 1. Coding scheme

#	Field	Type	Operational definition
1.	**SCREENCAST DATA**		
1.1	Duration	integer	Overall duration of the screencast (seconds)
1.2	Topic	text	Short description of the chosen topic of the screencast (text)
1.3	Target audience	label	Identified target audience of the screencast (either declared or implicit): Children, Teachers, Adult, Generic
2.	**BIG6 ELEMENTS**		
2.1	Task definition	1/0	The student explains what the information target/need is, not only stating the general topic (e.g., “cats”) but formulating precise questions (e.g., “how long does a cat live?”)
2.2	Information seeking strategies	1/0	The student explains where and how to search, for example what search instruments to use, what keywords to use, if it would be useful to refine the search query, etc.
2.3	Location & Access	1/0	The student explains how to find and access websites, e.g., how to reach a search engine page, where to write keywords, what buttons to click, etc.
2.4	Use of information	1/0	The student explains how and where to find relevant information within documents of different formats, e.g., reading the title or summary, etc.
2.5	Synthesis	1/0	The student explains how to make a summary of the information or use it to solve the information need
2.6	Evaluation	1/0	The student proposes an evaluation of the search process or of its results
2.7	Big6 score	0 to 6	Sum of the values assigned for the Big6 elements (2.1 through 2.6)
2.8	Credibility	1/0	The student discusses credibility criteria: why the selected documents can be considered credible (reliable) or not.
3.	**WEB DOCUMENTS**		
3.1	Search engine	text	Name of search engine used
3.2	Number of searches	integer	Number of searches performed in the screencast
3.3	Motivation	1/0	The student motivates the choice of the used search engine
3.4	Demonstration	1/0	The student demonstrates how to perform the search
3.5	Criteria	1/0	The student explains the criteria that the search engine uses to select and rank results
3.6	Comment	1/0	The student provides comments on the SER page or on individual documents
3.7	Web.number	integer	Number of web pages reached via a SER page shown in the screencast

3.8	Web.choice	1/0	The student motivates the choice of the web page among the other search results
3.9	Web.content	1/0	The student illustrates the contents or structure of the web page
3.10	Web.comments	1/0	The student provides comments on the credibility of the web page
3.11	Selected.number	integer	Number of web pages shown by the author without performing a search
3.12	Selected.choice	1/0	The student motivates the choice of the selected web page
3.13	Selected.content	1/0	The student illustrates the contents or structure of the web page
3.14	Selected.comments	1/0	The student provides comments on the credibility of the web page
3.15	Wiki.number	integer	Number of Wikipedia articles shown in the screencast
3.16	Wiki.choice	1/0	The student motivates the choice of the selected Wikipedia article
3.17	Wiki.content	1/0	The student illustrates the contents or structure of the Wikipedia article
3.18	Wiki.comments	1/0	The student provides comments on the credibility of the Wikipedia article
3.19	Comparison	1/0	The student compares web pages and information, e.g., about format or credibility
3.20	Useless search	1/0	An already known URL is entered into a search bar.

After refining the coding scheme, a set of 8 screencasts was coded independently by the two coders to test inter-rater reliability. Cohen's k was calculated for the sections in which individual assessments were more relevant, namely sections 2 (Big6 elements; k_B=0.913) and 3 (Web documents; k_W=0.909). In both cases, the value of k indicates *almost perfect agreement*. Disagreements were identified and discussed in order to fine-tune the coding process. The remaining 79 screencasts were coded by either coder. Few uncertain issues were marked, discussed and solved together.

Results

General remarks

The average duration of the screencasts is 139 seconds (shortest: 53 sec.; longest; 281 sec.; one outlier of 361 sec.). Most of them address a generic target audience (54) or adults (16), and only a few children (12) or other teachers (7). The addressed audience does not significantly impact other variables, such as duration or Big6 dimensions implied.

Some common errors appear in many screencasts, including confusion in using technical terms like "browser" or "search engine" in referencing applications like Safari or Firefox or actual search engines like Google. Another common mistake is typing the search words in any bar – be it an actual search bar or the browser address bar – or using the search bar for typing an already-known URL. This latter occurrence was labelled "useless search" and marked in the coding data of the screencasts (field 3.20). It appears at least once in 24 screencasts, i.e., in more than one fourth.

Online search concept: coverage of the Big6 dimensions

The coverage of the different dimensions of the Big6 model was considered as a proxy of an articulated concept of online search for pre-service teachers.

To explore the actual coverage of Big6 dimensions, a Big6-score was calculated for each screencast, indicating how many Big6 dimensions were touched upon once or more times by the author (field 2.7). The Big6-score average is 2,39, with mode 3 (Figure 1). No screencast included all six dimensions, and only one included none. A slight but significant positive correlation (r=0.32; p=0.001) was found between screencast duration and Big6-score, so that the authors of longer screencasts cover more Big6 dimensions. It is interesting to notice that no correlation was found between the overall number of documents presented in the screencast and the Big6-score: covering more information search dimensions is not related to how many web documents are presented.

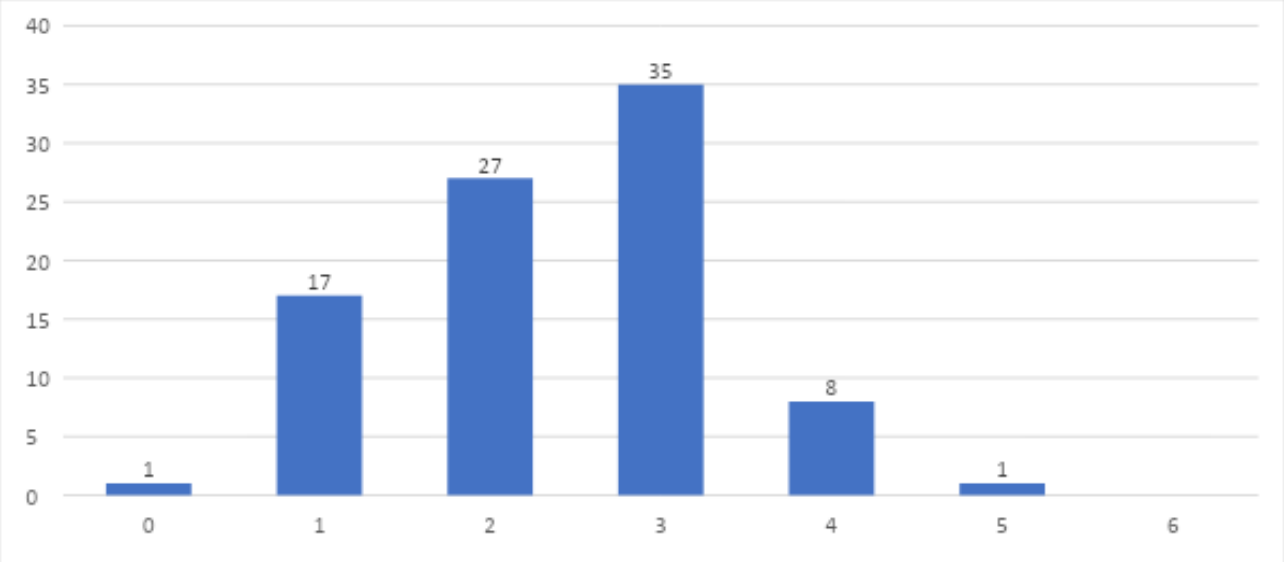

Figure 1. Big6-score distribution.

The next step in the analysis was about investigating what Big6 dimensions were more frequently touched upon. To this we added an indicator of credibility, i.e., if the author elicits the cues that led him/her to consider a web page reliable (field 2.8).

Figure 2 presents the coverage of the Big6 dimensions and of credibility. The most addressed dimensions are *Location and Access* (appearing in 86 of the screencasts, i.e., 97%) and *Use of Information* (70%). Indeed, most screencasts focus only on the mechanics of search: where you type your keywords, how you access results and how web pages are structured (e.g., where to find the ingredients in a recipe, or where to find useful information in a long page).

Only half of the screencasts define their *Search Task* properly. This feature was operationalized as "The student explains where and how to search, for example what search instruments to use, what keywords to use, if it would be useful to refine the search query, etc." In 45 cases the authors simply state the overall topic of their search (like in "I want to search about cats"), while only 44 specify an actual goal, like e.g., "Today we will look for a recipe to cook pumpkin risotto" [s12] or "Today we'll make a short search on the Internet to learn how to grow an avocado at home" [s23].

The other elements in the Big6 model barely appear in the screencasts. Only few screencasts present or discuss an *Information Seeking Strategy*, i.e., reflect on where to search (on what website or with what search instrument) and on the keywords to use, or if to refine the search during the process. Also, just one respectively two screencasts touch upon *Synthesis* (i.e., how to make a useful summary of the information found on the web) or reflect on the search process and outcomes (*Evaluation*).

Only 11 screencasts make comments about the credibility or overall quality of the documents they choose.

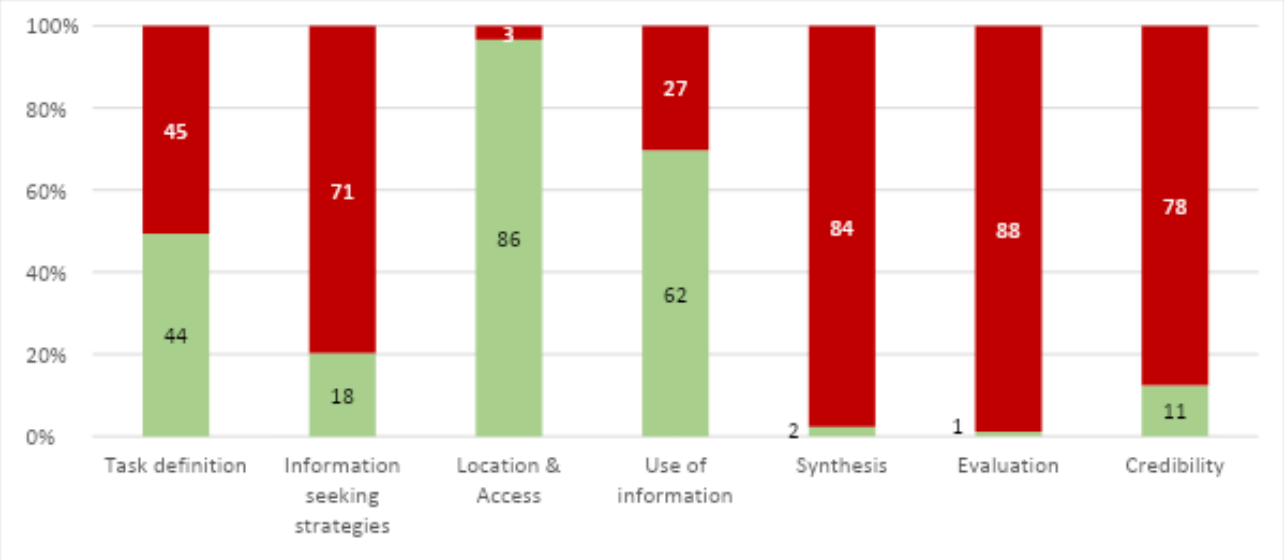

Figure 2. Big6 dimensions and credibility coverage (green indicates coverage)

About search engines

Online searches in most cases happen via search engines. A critical understanding of how such access points to the web work, and about the key differences between search engines managed by commercial companies (such as Google Search) and those managed by organizations with different business models (like DuckDuckGo or Ecosia) is central for the development of critical IL skills. Out of the 89 screencasts, 79 (94%) use Google, with only 1 student using Google Advanced Search. The others use DuckDuckGo (2), Bing (1), and Ecosia (1). This reflects the current dominance of Google, which currently accounts for over 86% of all web searches globally (Statista, 2022). Six students did not use any search engine at all, as they did not demonstrate the search process but directly presented the web pages that they had previously selected.

Most students (62) performed only one search in the screencast (Figure 3). A slight but significant positive correlation (r=0.21; p=0.05) was found between the screen cast duration and the number of searches performed.

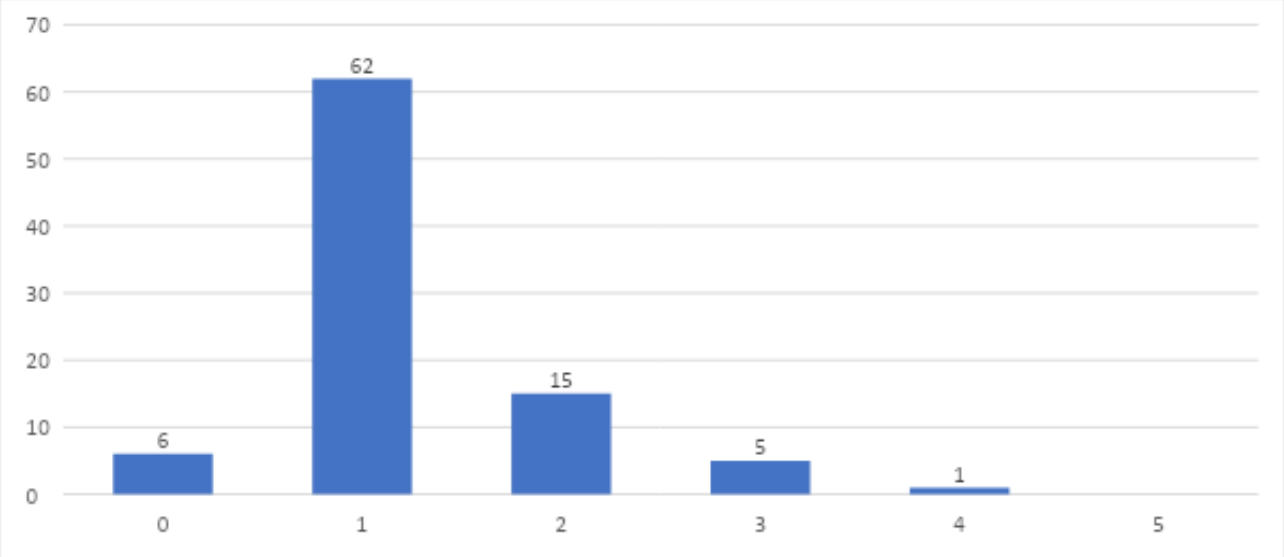

Figure 3. Number of demonstrated searches per screencast

Choosing a search engine or where to search does not seem to be a priority for the screencast authors. Only 16 of them declared what search engine they used (3 out of the 4 not using Google),

while the others simply searched on Google, which they seem to take for granted as the default or only search tool option. Nobody mentioned any reasons for choosing a particular search engine.

As illustrated in Figure 4, while most students demonstrated the mechanics of searching (writing keywords, pressing a search button), only three explained the criteria that a search engine uses to select and rank results. Just a few more (13, i.e., 14,6%) commented on the search results. Some screencast authors commented on the importance of choosing search terms, but none provided advice or examples on how to choose them, in most cases defaulting to entering the topic of the search, like “weather” [s82] or “panda” [s86].

The emerging focus of the screencasts seems to be about “how to” use a search engine and not on understanding “how it works”. Interestingly, only one student presented how to change the search engine settings instead of presenting the results. On the other hand, only ten students decided to present alternative domain-specific search instruments, like library catalogues, geographic data systems or online encyclopedias different from Wikipedia.

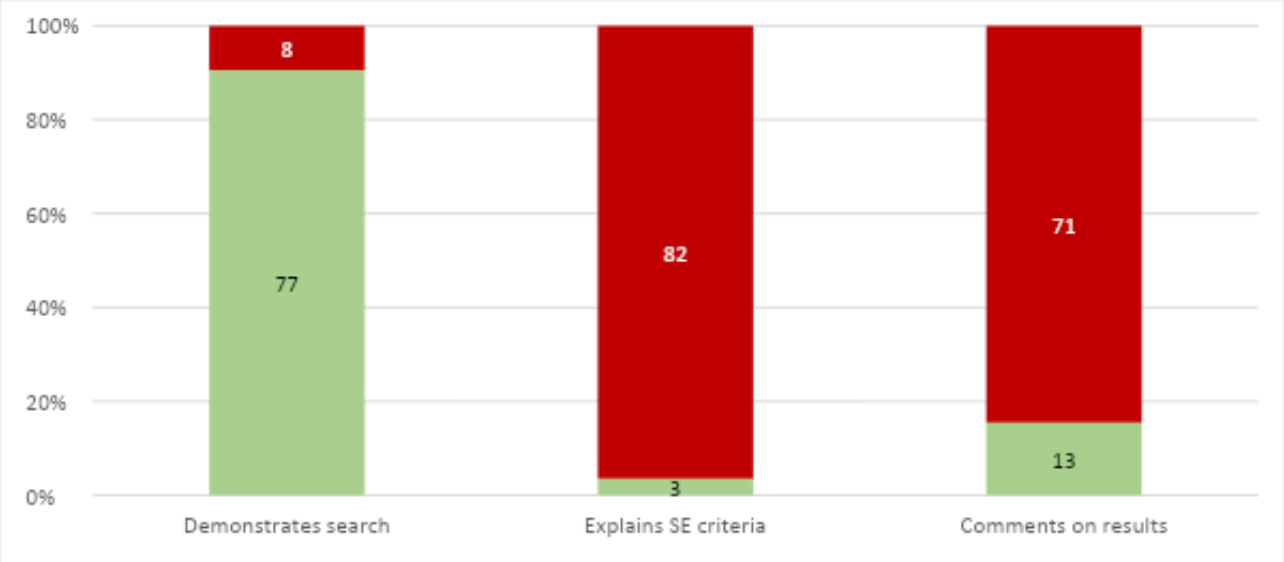

Figure 4. Screencast elements about search engines

Web documents

Across all 89 screencasts, 234 web pages were shown (average 2.63 per screencast). 161 web pages were accessed through a Search Engine Result Page (SERP) and 25 directly through their URL. The latter were classified as *selected* web pages. 48 web pages (either from SERP or selected) were Wikipedia articles. No correlation was found between the types or quantity of documents used in a single screencast and its Big6-score.

Only 23 screencasts draw some sort of comparison among the web pages they presented, pointing out formal features (e.g., the presence of pictures or the length of texts) or the purpose or target audience of the document (e.g., if web pages are intended for children or are suitable for specific uses). Nobody ventured into a critical reading of the web pages, e.g., using them as counterexamples of non-reliable documents.

Interestingly, none of the participants presented a social media page, even if all of them are social media users. This might be due to the assignment formulation (which asked to present “three websites”) or to the perception of social media as not suitable for (also legally not permitted to) children.

Discussion

This exploratory study investigated the naïve (i.e., pre-instructional) conception of online search of pre-primary and primary pre-service teachers by analyzing a set of screencasts they produced on

the topic. We assumed that an instructional screencast would capture what a prospective teacher considers essential in the topic at hand and we used the Big6 model as a reference to analyze the dimensions touched upon in our data.

The emerging picture

The vast majority of the analyzed screencasts focus on "how to" tips in relation to using search engines and accessing web sites, thus focusing on the *Location and access* and *Use of information* dimensions of the Big6. Less than half also include an explicit definition of the information task, while the other dimensions of the model are barely mentioned, and so is credibility. We can state that the overall emerging picture is that pre-service teachers think of searching for information on the web as a mostly mechanical or technical skill: learning to search online is presented as learning to use a search engine and to perform basic internet navigation tasks. Such a concept is scarcely articulated on the Big6 dimensions (or on any other set of dimensions) and relates more to online search behaviors than to IL. Mental tasks, like defining the information need, are mostly missing or scarcely elaborated. The challenge of assessing the reliability of documents and sources and of selecting *good* information also remains in the background.

The selection of search instruments is also rather narrow. Google Search is *the* search engine for our pre-service teachers, who only marginally consider both other search engines such as Ecosia, DuckDuckGo or Bing and domain-specific search instruments such as online encyclopedias or library catalogues. While this reflects Google's undiscussed dominant market position, the absence of any questioning or motivation in the choice of the search engines suggest a non-reflective approach – indeed, "googling" is just one more standard daily operation.

Finally, student teachers seem to rapidly select web pages and Wikipedia articles but are not able to provide reasons for their choices, or do not think that giving hints about credibility is important. In our screencasts very few comments on the selected web pages appear, and even more rarely their authors compare different websites or provide elements to assess their credibility.

Educating teachers to Information Literacy

The main purpose of this exploratory research study was generating indications for the development of sound pre-service teachers' IL education. The results clearly indicate the first need is the development of a more articulated conception of "information search", which is not confined to online search behaviors and mechanical tasks but extended to all IL dimensions, following the Big6 or any other IL model. This represents indeed a didactical challenge, as it requires drawing critical attention to information processes, which today, in our information overabundance society, are perceived as trivial and automatic tasks. In particular, the most complex cognitive operations need to be assigned a place in teachers' mental picture: defining a search task, determining a search strategy, making a synthesis of the information and evaluating the search process.

Credibility assessment should also be elicited as one of the most important skills. In our interconnected and always-on society merely finding information is not difficult – the real challenge is filtering out the information we actually need *and* that we can trust. Under this respect, establishing the notions of *primary* and *secondary* sources seem crucial (Raphael & Pearson, 1985), as different from *popularity*. Also, concepts *like lateral* reading and *click restraint* discussed above (Wineburg & McGrew, 2017), and instruments like SIFT (Caulfield, n.d) appear as highly relevant.

A broader experience with search instruments can also make a difference, empowering teachers to choose their tools according to their own needs and constraints, and to avoid defaulting to the easiest or most accessible one (Google Search, in this case). This would include knowledge both about alternative generic search engines such as Duckduckgo, Ecosia, Yandex or Qwant, and about domain-specific tools such as library catalogs, online encyclopedias, web reference tools, etc.

Finally, we found out that longer screencasts are somehow richer. This suggests that asking students to engage in complex tasks that require more time (maybe even forcing them to perform

more than one search) might facilitate the emergence of more nuances and lead to good learning questions. Professional scenarios, e.g., entailing teaching information search to children or working with peers, might provide richer stimuli than personal scenarios (e.g., searching for information about holidays or personal hobbies).

Outlooks

This small exploratory study is only a first approach to teacher IL education, which is central to the establishment of effective IL education in compulsory schools, beyond any good intention declared in official programs. Its main limitation is its strictly local context: we expect that prospective teachers from other countries (or even Swiss Cantons) might have a different approach to IL, both based on previous education and on culture.

The results of the study also depend on the data collection instrument. In our case, using screencasts offered a more naturalistic and less artificial setting than think-aloud lab sessions or surveys, and yielded interesting results. A different formulation of the stimuli might have promoted more focus on otherwise neglected issues; different constraints (e.g., about the maximum duration of the screencasts) might also have led to different results. For these reasons, complementary classroom-based research projects could be imagined on these lines.

Finally, we only focused on the pre-instructional conception of information search. If a teacher were to actually bring IL to his or her class, this would also require motivation ("Is it important?") and self-efficacy ("Am I able to teach it?"). Further investigations on these aspects, and on how they relate to what we presented here, are also important.

The unarticulated and behavior-oriented idea of information search of teachers seems to call for the introduction of conceptual IL models in their education. Under this respect, the Big6 seems an accessible and useful model - but it is just one among others available in the literature, as we discussed in the first section of the paper. An exploration of how using a formal model for teacher education can support the development of a more articulated conceptual development, with a focus on higher-level cognitive operations like determining a search strategy, would be beneficial, and would represent an optimal follow-up study. Also, combining the elicitation of the concept of IL with an assessment of IL skills - which we did not address in this study - would provide indication about the relevance of a theory-supported approach to IL education.

For democracies like Switzerland and Western countries, in which citizens take collective responsibility for their choices, being able to locate, access, select, use and disseminate quality information are fundamental skills for pursuing the common good. While the world gets more and more interconnected and populated by pervasive media, and we shift from a global pandemic to a complex war scenario, the importance of educating a generation of information literate citizens is more and more urgent. The catalyst that can transform curricula and models into action are teachers and the key to unlock such process can only be adequate teacher education.

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