Games to Improve Students Information Literacy Skills

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Abstract

As digital natives enter higher education, there is the opportunity for the development of innovative and engaging approaches to information literacy learning. The serious games can engage and motivate students in the learning process and provide opportunities to improve their information literacy skills, when they overestimate their ability to find quality information. The paper demonstrates the practical results of NAVIGATE - Information Literacy: A Game-based Learning Approach for Avoiding Fake Content, a project funded by Erasmus+ program. The Project aims to improve the higher education students in Humanities competencies in avoiding fake content. The paper focuses on the comparative analysis of the students' skills gap and the difficulty of actually assessing learning improvement, highlighting the lessons learned and the open issues.

Keywords: information literacy, serious games, humanities students, NAVIGATE project

Introduction

The digital natives have become online information consumers and use sources different from library sources such as websites and social media (OCLC 2007, 2014). However as information seekers, they need a certain amount of subject expertise to truly judge whether a source on the topic is credible (Beheshti 2012).

Digital natives also use mainly mobile devices to search for information. Walsh (2012) lists three key areas that emerged from his survey findings analysis:

- How people search for and evaluate information on the move (including "Searching for information is quick and easy"; "Information needs are contextual"; and "Searching can be social");
- How people use information and create new knowledge on the move (including "Our memory can be outsourced"; and "Mobile internet acting as a bridge between devices");
- How people cope with the 'always on' nature of mobile information ("Information is constantly pushed at us").

As digital natives enter now higher education, there is the opportunity for development of innovative and engaging approaches to information literacy learning. Fueled by mobile devices, new learning platforms and university incentives to active learning, learners are trying and achieving success with new learning models.

Libraries are instrumental in improving the information literacy skills of young people. The traditional approach to information literacy education however is the "one-shot" method, in which a faculty member invites a librarian to a classroom, to discuss discipline-relevant resources and library services. This passive learning experience creates a latency between the time of instruction and the actual usage of a library resource and requires repeated contacts with students to be successful. In addition, the collaboration of librarians and teachers is not always good and courses for information literacy are not considered as an essential part of the curriculum (Shenton and M. Fitzgibbons 2012).

The main obstacle seems that students overestimate their ability to find quality information and they lack motivation to learn information literacy. At Trobe University a questionnaire has been submitted to students to understand their previous knowledge (Salisbury 2012). In terms of using information to learn, students'

prior experience provides the scaffolding that enables them to augment their existing knowledge. Also the Stanford study (2016) related to social media and website used in student assignment, has added fuel to the discussion, suggesting university students have very weak evaluation skills.

Fake News

Fake news in higher education is considered disinformation, inaccurate information, not certified information (Calvert 1998; Calvert 2001; Walsh 2010). The phenomenon of fake news is very old but the problem became more current with social media and online information, as many students do not have the skills to evaluate information and many overestimate their competencies. In some cases, students want to believe what they like despite all the evidence (Ecker 2014, 2015; Floridi 1996).

Librarians can play a vital role in helping students to fight fake news and become critical and reflective media consumers (Banks 2016; Berry 2016; Barclay 2017). According to the new CILIP definition of information literacy, it is "central to librarians and information professionals as they create, select, organize and enable different types of information to be used ethically" (CILIP, 2018). Librarians indeed have used the fake news phenomenon to highlight their traditional role of training for critical thinking skills and for evaluating information. They can actually collaborate with all the other stakeholders, because the problem is more complex.

Rather than focus on identifying fake news, it made more sense to teach students how to recognize good quality information. ALA (2017) and IFLA (2016), among many Library Associations, have produced programs that highlight the importance of information literacy for avoiding fake news.

How information literate are the digital natives? And what information literacy skills do they bring to university? How can games improve the students' learning for avoiding fake content? These were the initial questions of the NAVIGATE Project. In this paper, we describe how the NAVIGATE Project[1] results can be used to improve the information literacy skills of Bachelor students in the Humanities.

[1] The article presents the findings of the Project NAVIGATE – Information Literacy: A Game-based Learning Approach for Avoiding Fake Content (09/2017-08/2020), a project funded by Erasmus+ program under Key Activity 2 - Strategic partnership supporting innovation. ERASMUS+ Project 2017-1-BG01-KA203-036383 (https://navigateproject.eu)

Aims and objectives

The NAVIGATE project is learner centred and aims to improve students' learning. Students must become "media and information literate" and with the capacity to understand, assess, evaluate, and apply information to solve problems or answer questions about fake content. In order to enhance students' competences in recognising fake content, NAVIGATE has planned:

- To develop a game-based model for information literacy learning consisting of a syllabus and a competency tree;
- To elaborate learning material such as games to be embedded in the curriculum, such as working modules with specific game tasks, other game-based learning activities.

The definition of fake content adopted by the NAVIGATE team is as follows: fake content (print, digital, oral) is considered disinformation, inaccurate and uncertified information. To filter fake content the CRAAP test is used and the measurable characteristics of quality information include: currency (timeliness), relevance, authority, format (accuracy), and purpose.

Game-based Learning

Michael and Chen identify games that have some educational purpose as serious games. According to them, "games that do not have as their primary purpose fun and enjoyment are serious" (Michael and Chen 2006). Serious games describe the use of games for learning to be perceived as "relevant" in order to engage students in active learning. The entry level of a game should pose challenges that are specifically designed to allow players to generalize a decision making procedure for subsequent more complex challenges. Each successive cycle throughout the game produces mastery of specific skills.

Games have been studied mainly as technology, without examining the nature of play as a philosophical phenomenon. The teaching theory of Fudenberg and Levine (1998) evidences the research on game applications. The scholarly discourse on games as tools to improve learning began with James Paul Gee's (Gee 2004) monograph on game-based learning, titled "What Video Games Have to Teach Us About Learning and Literacy". Gee expounds upon the many ways games facilitate learning including encouraging exploration and discovery, just-in-time learning, and applying active learning methods. Relevant studies dedicated to the theory and practice of serious games for information literacy have been written by Smith (2007) and Ness and Taubert (Ness and Taubert 2014).

The literature demonstrates that librarians have considered it worthwhile to incorporate games in training for library orientations, engagement in self learning sessions, practicing specific library skills, and more (Angell and Tewell 2015; Boudreau and Hanlan 2012). An additional advantage to game-based learning (Smash 2011) is the contribution of gameplay to affective elements that contribute to learning, such as student enjoyment of the session and intrinsic motivation. NAVIGATE also posits that students playing games are well-suited to engaging in library learning experiences.

Methodology

In the first phase of the Project (Output 1 - O1), a comparative study of the information literacy competences of the students was carried out in the three universities in Parma, Sofia and Gävle. When planning the game-based learning model developed by NAVIGATE, the project team analysed different frameworks for information literacy training paying special attention to those applicable in higher education like ACRL and SCONUL. We also studied EUROPASS digital competences framework and included it as a tool for self-evaluation by the learners in addition to the comparative survey on the information literacy perceptions and skills of students in Bulgaria, Italy and Sweden conducted in the first phase of the project.

The sample was composed by students in Humanities from the three partner universities (in Bulgaria, Italy and Sweden), full-time, Bachelor's programs. They were selected in compliance with the: educational degree, specialty, year of study. The total number of the respondents in the three universities was 423. The data were collected in the period December 2017 – January 2018. Open questions were processed and analysed by the following means: manually in the traditional way; via the web tool LIX counters Readability Index (LIX); via classification of the students' answers using the Framework SCONUL Seven Pillars of Information Literacy. On the basis of the results, a Competency tree[2] was elaborated, including the necessary competencies for students to avoid fake content. The Italian Team conducted a workshop to better understand what competencies the faculty would like the students to learn. The outcome of the workshop provides examples of learning situations and strategies that have assisted in the development of games to be embedded in the curriculum.

In the second phase (Output 2 - O2), around 67 games used for learning information literacy in academic libraries were identified and evaluated. The top 20 games for information literacy have been ranked according to three aspects: technological interface, content, pedagogical aspects (outcomes, activities and

[2] https://www.navigateproject.eu/o1/competency-tree-as-a-wheel/

assessment). An interactive database was developed accessible through the project's website[3] in order to visualize the list and categories. Output 2 results were the systematization of existing digital games and collecting examples of the competencies included in the competency tree into existing course curricula.

The third phase (Output 03-05) involves the development of games for information literacy with the following activities: (03) development of a game design template and the ideas and scenarios for the games; (04) definition of the specific learning objectives and development of the learning games; (05) definitive games design, content management and implementation of online platform; finally, pilot testing of the games.

Findings

Among the results obtained, two aspects seem particularly important to us: the students' gap and the assessment of learning achieved through games. The skills gap is very similar for students from Italy, Bulgaria and Sweden but the biggest differences are in knowing how to evaluate fake content. Learning assessment is one of the features less practiced by the information literacy games that have been evaluated. On these two aspects we would like to describe the lessons learned and the open problems.

Students context

In the three participating countries the information literacy sessions are offered in different ways – in Bulgaria they are integrated in the curriculum as part of mandatory or elective courses, while in Italy and Sweden they are usually a part of sessions organized by the university libraries.

All students have an electronic device and are always connected, but do not use the technology for learning. In mobile literacy there is a greater importance of digital competences. This has two aspects. The first is that students consider the digital competences necessary and many of the respondents consider themselves sufficiently equipped to find information online, just knowing how to use the device. The second aspect is that they tend to neglect research strategies and to underestimate the management of information. Doing an analysis of the students' answers on their concept of information literacy, mobile literacy and fake news, we can evidence an overlap between information literacy and digital competences: there is confusion about knowing how to use the device to search for information and knowing how to search for information.

[3] https://www.navigateproject.eu/navigamesearch-tool/

The learning style is still traditional. Many like to study at home, few prefer the library, but the Library is used as a place not for its services, including availability of databases and digital resources. It is important to note the apparent contradiction between the answers because they can highlight two different styles of learning and teaching: active learning and teacher centered teaching. While studying for exams is notional and based on the textbook, doing exercises at home requires more information resources. Therefore, it is necessary to stimulate active learning in order for students to become more information literate. In terms of using information for learning, the previous student experience provides the scaffolding that allows them to increase their existing knowledge. One of the most effective ways to ensure that students become skilled in handling good information is to include information skills in the curriculum, with autonomous courses centred on the library, but also with embedded courses integrated in the classes and adapted to the different subjects. The collaboration with teachers is essential to stimulate better information literacy.

Another issue that we considered for the pedagogical model was the context of fake information which is central to NAVIGATE project and following framework has been formulated: every person has prejudices and values that let his or her trust in certain information more readily; information is published for the advance of science and knowledge but it might as well be a published for political or religious purposes or related to financial gains; complex questions demand sophisticated, multi-level solutions not simple answers.

Students competences gap

The analysis of students' answers to the NAVIGATE survey on information literacy competencies clearly shows where and in which areas students have serious shortcomings and they need additional competencies related to the gap of information skills. Comparative analysis has shown that students come to university with prior knowledge and that the behavior of digital natives has many similarities in the three countries.

According to SCONUL's concept for 7 pillars of information literacy, this means that some of the most serious problems related to the understanding of information skills are:

- As for identifying the need for information, students often have difficulties in recognizing the lack of sufficient knowledge on specific topics, including achieving well-defined educational and other goals. This can be seen as an explanation for their inability to plan a successful search for information (Identify);
- Also, understanding the notion of "information literacy", which is predominantly based on its technological aspects, prevents students correctly identifying the appropriate information sources (Scope);

- Serious gaps have been identified regarding their skills to build an information search/search strategy (Plan).
- Generally, as far as the critical assessment and comparison of information sources is concerned, there are also unsatisfactory higher education skills (Evaluate).
- Considering all of the above, students encounter difficulties in presenting the information regarding its inclusion in its own knowledge complex (Present).

The activities of the preparatory phases of the research process are underestimated. The skills of knowing how to manage and present information are underestimated too.

It is interesting to note that students in the survey evidence that the preparatory activities of the research process disappear: how to identify needs, plan and understand what is already known. The planned activities are reduced to: gathering, evaluation and presentation.

Evaluation of information

This competence reveals greater differences between students than the competence of knowing how to search for information. The students evidently rely on previous individual experiences that they consider valid also for the university context.

To analyze information quality criteria, we used the Berkeley Library[4] criteria together with the CRAAP test (Figure 1). The first criterion for students from Sweden (54%) and Italy (35%) is the format (accuracy) of the resource, for students in Bulgaria (38%) it is the relevance to the research. Author of the source is considered important only in Sweden (39%), not in Italy and Bulgaria. The documentation is instead considered important in Italy (29%) and Sweden (31%) but not in Bulgaria (1%). Currency is relevant only in Bulgaria (25%), not in Italy (8%) and Sweden (7%).

[4] https://guides.lib.berkeley.edu/evaluating-resources

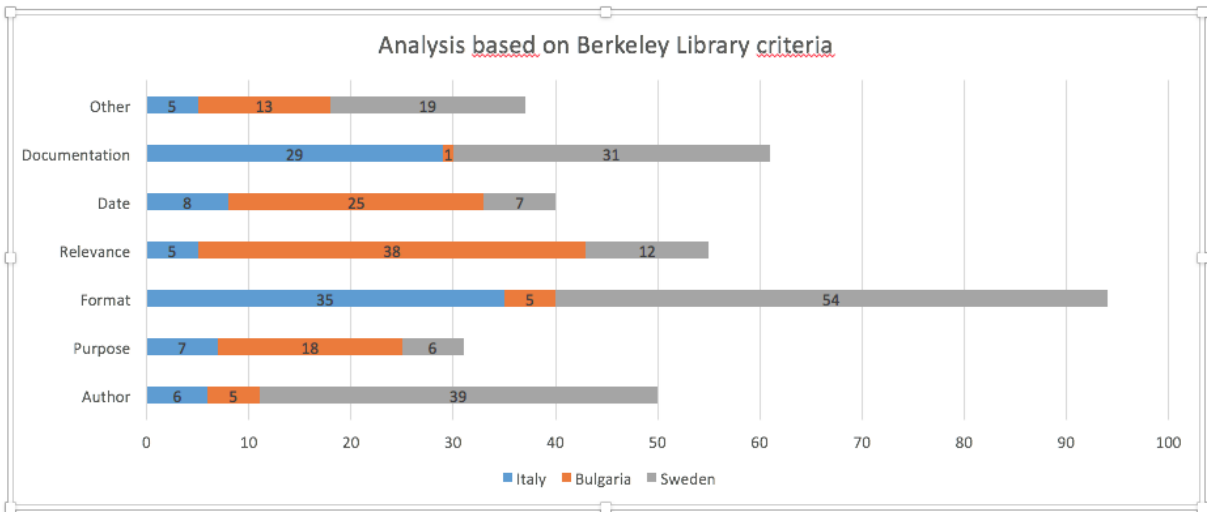

Figure 1. Evaluation criteria

As regards the criteria used by the Bulgarian students to assess the search results on the Internet, the quality of the information is a determining factor for 44 % of the respondents, stating that it should be "credible", "relevant", "useful", "specialized", or "up-to-date". For 20.7 % of the respondents the source of information needs to be "secure", "reliable" from a "verified source". Popularity, in terms of "site visits", "number of positive comments", "number of views", is a determining factor for 7 % of the participants. For an equal number of respondents (5.7 %) the access (quick, easy finding of information, etc.) and the author, ("known" or "checked") are important. The books are important for 2.3 % of the respondents, and 1.1 % say the full description. Other views are shared by 5.7 % of the respondents, and one participant says that "I search for information in books because content is 100 percent true". Search criteria are not applied by 3.4 %, explaining that "I use what is useful on the subject". They believe that criteria for assessing the results do not exist and therefore 2.3 % of the total do not apply them, and according to another 1.1 % "those criteria are not so many" but do not specify any more. Opinions were not shared by 50% of the Bulgarian students surveyed.

Many of the Italian respondents (31 %) compare various sources of documentation and apply a selection of preferred sites (37 %). Few check information relevance for the need of information (5 %). Surprisingly, very few consider author reliability (6 %), and the purpose of information (7 %), as relevant. The presence of a date is considered relevant only for 9 % of the respondents. Other considerations include comments in forums, and ephemeral aspects such as color and layout (5 %). It seems that the ability to evaluate the resources is really insufficient and not adequate for assessing the quality, accuracy, relevance, credibility, format and accessibility of information.

The most frequent criteria used by the Swedish students to evaluate search results on the Internet were the publication format followed by author (Authority), and the Documentation – if the text has credible references and sources. The relevance, purpose and the date of publication were less frequently cited as criteria applied by the respondents. The text's readability index is 39, which means that it is classified as easy to read. Two students express the word "Impartiality" as a criterion. It is interesting to note that academic students interpret and recognize relevant information as impartial. What exactly the students understand in this definition or concept is something to be investigated further. The question or term "Bias" is perhaps what is meant. It is possible they are referring to the places of the publication or author affiliation. The text's readability index was pretty low and could indicate that the students have not internalized the terms, definitions and concepts - ways to talk about, discuss or to do survey plans or scientific studies. They "lack words" in the field of academic research such as critical information retrieval, information processing and data processing (Encheva et. al. 2019).

Assessment of students learning

NAVIGATE aims to use game-based learning to support teaching of teachers, trainers and librarians reusing the existing information literacy games and motivate them to create their own information literacy games both in face to face learning sessions and in e-learning environments. How do we know if students learn or are engaged? Some of the most promising uses of games for teaching and learning are the new opportunities they may provide for assessment. Considering the specific serious game domain, Michael and Chen describe three primary types of assessment:

- completion assessment,
- in-process assessment, and
- teacher assessment.

The first two correspond to summative and formative assessments, respectively. Completion assessment is concerned with whether the player successfully completes the game.

In the design of the games, NAVIGATE has tried to achieve completion assessment engaging the students using technical storytelling and a points system. In their book "*Motivating Students in Information Literacy Classes"* Jacobson and Xu examine in detail the application of the motivational design (ARCS) model in information literacy courses (Jacobson and Lijuan 2004). Games have the potential to become a strategy for attracting students' attention, especially if they have a stereotypical perception of libraries and of the literacies related to them. At the same time, they can also be a component of the design influencing the

other elements of the motivational design model - relevance, confidence and satisfaction. Engagement requires action learning, to do something meaningful with course content. Malone and Lepper had a focus with instructional design built entirely on intrinsic motivation. Their argument was centered on the fact that intrinsic motivation is inherently necessary for learner engagement with activities. As such, they introduced a taxonomy with two parts for designing intrinsically motivating educational environments: individual motivations and interpersonal motivations. This taxonomy relies on elements of competition, challenge, curiosity, control, fantasy, and work with peers to engage the learner on various levels to keep them engaged through the entire learning process (Malone and Lepper 1987).

The use of educational games provides the teachers with an option to reconsider the traditional strategy for formative and summative assessment. Competencies that are difficult to measure with traditional assessments, such as problem-solving, critical thinking, and inquiry skills, may be evaluated by "stealth assessment" observing student activities within the context of gameplay (Kaya 2010, Shute 2011). NAVIGATE has tried to adjust the gameplay to address different levels of competency, in order to give students more time to work on skills or concepts they experience difficulty mastering (Kaya 2010). Through the games the students put in practice the concepts and they learn in a constructive way. They master their skills and get immediate feedback about their progress through stealth assessment. The serious games also help in the identification of misconception and support the overcome of the existing gaps in knowledge and skills.

It is assumed that the inclusion of games will positively reflect on the achievement of learning outcomes. Serious games bring benefits to all participants who continue beyond the end of the game itself (Jaffe 2007). It is also suggested that the inclusion of game elements in information literacy training will excite the millennium generation and will help the young people to remember the core concepts and to acquire more easily important skills related to learning that will be used throughout their whole life (Doshi 2006; Prensky 2001). According to Chow, when used for learning, the games contribute to the transfer of the acquired knowledge and to the reach of a level of relevance that will assist students in more appropriate follow-up (Chow and Kelly 2011). Thus, these benefits related to the acquisition and transfer of knowledge can improve the teaching of information literacy competencies.

However, the use of serious games poses a number of challenges to the teacher. In addition to adopting active learning and improving his/her skills, he/she must be also flexible about the innovative methods of games-based learning. The game application provides diversity and helps teachers to respond to students' changing expectations and preferences so that they can feel "more connected" instead of "fragmented" and "isolated" (Fink 2003).

Lessons learned and conclusions

The use of serious games in higher education has great potential, mainly for the impact on learning improvement. Games used in a university setting, stimulate active learning by students through activities stimulating research, experimentation, competition and collaboration. Educational games are also directly focused on the competencies needed for the information age: self-regulation, information skills, networking, problem-solving strategies and critical thinking. It is also important that they are widely accepted by new generations of learners, the so-called digital generation that has grown, immersed in new communication technologies. Games encourage creativity in information literacy training and can be a useful tool in overcoming the generation gap between the teacher and the student. For these reasons we think that the use of games in class could increase the students' motivation and engagement in learning activities.

The application of NAVIGATE game-based approaches in information literacy training sessions for Bachelor's students in Humanities is now in the testing phase and can be experimented as a good strategy for delivering student-centered learning in the universities. However serious games have not yet become a leading trend in information literacy training. NAVIGATE experience has demonstrated that game-based learning and gamification techniques demand a lot of effort from teachers, instructors and librarians.

To make the use of games more widespread, a crucial aspect is that educators need to add them to their curriculum design, adapting quickly to changes in technology, in active learning pedagogy and digital competencies. In the design of games and in the creation of rubrics of best practices regarding the assessment of students' achievement, teachers need to share knowledge and collaborate with librarians. Instructor librarians can become leading practitioners in the implementation of games in higher education, evidencing the importance of the library profession.

In conclusion, the NAVIGATE project has defined a game based model for information literacy focused on the collaboration of librarians and teachers and games and other learning materials with the aim of improving students' learning.

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