EINFOSE

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INTELECTUAL OUTPUT O4 - DIDACTIC FRAMEWORK

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1. Introduction

By Serap Kurbanoglu

In education, the last few decades have witnessed a progressive change from teacher-centered pedagogies and practices towards student-centered and more personalized learning. This means that students' needs, interests, backgrounds and learning styles are placed at the center and students start to become more actively and flexibly involved in the learning process. Advances in Information and Communication Technology (ICT), especially in the areas of online educational programs and video content creation and delivery, have enabled the implementation of flexible and personalized learning spaces.

Research findings suggest that, in order to be effective and engaging for the millennial generation, learning and teaching approaches should go beyond traditional lecture instruction. Millennials, raised with information technology and 24/7 connection to information, have a preference for environments that support multi-tasking, group work, and engagement with the social aspects of learning. In response to the expectations of Millennials, Higher Education Institutions (HEIs) have recognized that in order to promote learning, maintain student engagement and increase student satisfaction, the wise utilization of technology and innovative pedagogies were essential. Consequently, pedagogies became geared towards Millennial learning preferences, and started to combine the traditional face-to-face classroom instruction with activities facilitated through a range of technological resources outside of the class. As a result, blended learning, flipped classroom model, online instruction, video based instruction , OERs and MOOC have emerged and became increasingly popular.

Today, in Library and Information Science (LIS) education, there is a trend towards an increasing focus on information technologies (an inevitable result of massive technological advances), users perspectives, basic human values and the role of public funded information institutions in allowing free access to information, supporting freedom of expression and multi-disciplinarity. There are new career opportunities for LIS graduates as new positions are opening up in areas such as knowledge management, information architecture, research data management, management of information services and human resources in a digital environment and digital humanities. While LIS education is transforming, the debate over the education is intensifiying. Strategic decisions such as the changes in the structure, scope and focus of individual LIS schools/programs require not only a careful examination of literature regarding the flux in the discipline, but also a careful examination of innovative pedagogies and new didactic trends.

The EINFOSE is an Erasmus+ Key Action 2 - Strategic Partnerships for Higher Education (HE) project to develop educational guidelines and recommendations for LIS/IS education. One of the project's goals is to investigate ways and means of lowering barriers to the students' enrolment at graduate programs in LIS/IS and introducing various social, cultural and technological experience in IS education across Europe. The project aims to produce five main intellectual outputs (IO): online teaching and communication platform; online educational resources (OER) to be used during and after European Summer Schools in IS (ESSIS), evaluation and didactic frameworks, and policy recommendations. Teachers and students from all partnering universities/countries have participated in ESSIS. During the summer school (held in 2017 in Germany and in 2018 in Austria) students participated in four face-to-face courses. A one month online pre-assignments and two months of online communication following the ESSIS were obligatory for all participating students.

This report is prepared to investigate new didactics and developments to be able to design an appropriate didactic framework for EINFOSE based upon theories, principles and recent trends that could support new visions for HE in 21st century as well as experiences and observations of faculty who is involved in teaching

at LIS schools and summer school students. This document starts with a section on didactic approaches in 21st century to provide an overview, continues with detailed examination of learning styles (since student-centered pedagogies are adopted) and new instructional trends such as flipped classroom, gamification and MOOCs. Didactic Trends in LIS Education as well as the evaluation of ESSIS 2017 and 2018 from didactic point of view are also included. Conclusions and recommendations are drawn for the didactic framework are expected to be useful not only to improve summer school but also for any similar IS education program.

2. An Overview of Didactic Approaches in 21st Century

By Tatjana *Aparac-Jelušić*

Education in general, and distance education and online education systems in particular, inherited theories and models from Didactics as a special field of Pedagogy. Didactics – as it is widely accepted – deals with theories, ideas, principles, and instructional design and applications in order to support a successful conduction of educational process. Didactics in the 21st century is a rather challenging area weather it aims at discovering new models and methods appropriate for the generations of learners as well as teachers confronted with technical and economic developments from one side, or recognising the need to constantly adapt to diverse cultural and uncertain socio-political and ecological environments, from the other side.

Methods, theories and principles in education have been developing for centuries. The first evidence of systematic teaching began over a thousand years ago in old Sumerian, Egyptian and ancient Greek civilizations, but it was conducted for the chosen few literate persons only. It was only at the beginning of the 17th century that mass education of youth began and first educational curricula were developed.

Socrates introduced a dialogue method which is popular even today, especially in the educational area that uses the so-called critical thinking. Many other approaches started to be in practice from the beginnings of modern pedagogy and related work of a Check pedagogue Jan Komenski, and several other reformists, such as J. F. Herbart, G. Kerschensteiner, H. Parkhurst, John Dewey, William H. Kilpatrick, who offered a basic theoretical frameworks for the didactics and pedagogy in general.

The development of theory and practice was especially intensive in the 20th century, and many application of proposed didactics frameworks were described and evaluated. Broad concepts of constructivism and socio-cultural learning theories seem to have replaced education theory and didactics as conceptual framework which aimed at reasoning on teaching goals and practice in Higher Education. According to Qvortrup et al (2016, p. 163), Luhmann's interpretation of didactics as theories or programs for reflection, is highly inspiring to start looking at different theories and approaches that have been discussed in relation to the growing need to understand the societal change.

As Didactics has been using theoretical models developed in philosophy, psychology and sociology, in order to design theoretical models of teaching and learning, it is confronted with concepts offered by theoreticians who has been often in disagreement or contradictory, depending upon their starting positions. It is widely accepted that older didactical concepts, for instance, were directed towards teaching and the teacher's role in education, while newer concepts concentrate more on the student and his/her place inside the learning process. As expected, attention has been paid also to didactics of e-education which draws on application possibilities of ICT and acceptable models of instructional design (ID) which actually had roots in programmed learning and computer based instruction. It is interesting to note that authors who deal with electronic learning (e-learning) often see this as a recent initiative and aren't aware of the fact that e-learning started as early as in 1950s. Thus, a wide base of didactics already exists and it should be approached with critical appraisal of models that have been introduced in order to satisfy ever growing educational needs of new generations. There are many of these models used in HE (such as Dick and Carey model, J. M. Carrols Minimalism, R. Gagné's ID model, Algo-Heuristic model), which seek to focus on learning, not technology itself. However, the role of instructional design in e-learning has been often misunderstood – due to the perceived complexity of the process and to poor understanding of the pedagogical requirements of e-learning (Siemens, 2002).

The dominant philosophies of learning and teaching have undergone significant changes and developmental paths over the past century – from *behaviourism*, to *Gestalt* and *Denkpsychology* and from the middle of the 20th century *cognitive psychology.* During the 1970s and 1980s, another theory emerged to overcome the limits of cognitive approaches – *constructivism* – which suggested a more student-centred approach to instruction and the new role of the teacher who was not seen only as the direct transmitter of knowledge, but rather facilitator of an active, self-directed construction of knowledge (Brown, Collins and Duguid, 1989, 32). Numerous instructional approaches were and still are based on constructivism. At the end of the 20th century, another approach was introduced to educational theory inspired by the ideas of Vygotsky and culturally comparative research (Vieluf, 2012, 28–29). Known as socio-constructivist theories which focus on examining the interaction of psychological processes within the learner with social and situational characteristics of the learning process, these theories introduced the notions of 'self-directed learning', 'co-operative learning', 'self-regulated learning', 'guided discovery', 'scaffolding', 'cognitive apprenticeship', 'teacher-mediated dialogue', 'independent group discussion', 'problem-based learning', 'project-based learning', 'knowledge building' etc. (Vieluf, 2012).

In Europe, at the policy making and funding level since 1990s several action programmes had a significant impact on collaboration between HEIs in Europe, including the attempts to modernize education by the use of ICT in education and research in education, such as Tempus, Phare and Leonardo da Vinci, Socrates, and Erasmus. The programs were funded under projects known as eEurope 2002, eLearning Programme 2004–2006, Europe 2020 Strategy. Innovation in education and training became a key priority in several flagship initiatives of the Europe 2020 Strategy (for example, in Agenda for New Skills and Jobs, Youth on the Move, Digital Agenda), where the contribution of ICT to achieving these targets was recognized (Aparac-Jelušić, 2017) and financial support given to investigate new models and frameworks for education at HEs.

However, after a period of 15 years of major reforms across Europe as part of the Bologna Process, it is evident that the implementation of these reforms is not yet entirely completed. Nevertheless, it is evident that improved quality appeared to be increasingly linked to information society, digitalisation, internationalisation, research and innovation capacity and, to varying degrees, to the impact of the economic and financial crisis.

Further discussion turns around the question such as: What happens when basic assumptions about education no longer apply, and did these basic assumptions change at all?

2.1. New Approaches to Didactics

Didactics is usually understood as a branch of pedagogy dealing with *general patterns,* including the conditions and consequences of educational process, and *special issues* that are focused on defining goals and mission of education; explaining dynamics of educational process; analyzing social forms and conditions of educational process, including communication and the way knowledge is transmitted.

In 20th and even more in 21st century, rapid technological changes have increased information availability and have radically improved communication. The traditional methods of instructing students – such as memorization, repetition, and basic comprehension – are no longer sufficient. According to Kapitzke (2006) 21st century school-aged students are rapid processors of information and demand more expedient methods of instruction and communication, especially when enrolled at HEIs. In order to better understand the 21st century educational context, Owston (2007), Scardamalia and Bereiter (2006) suggest that it may be helpful to start from the fact that mere declarative knowledge has given way to knowledge building processes which pay attention to students who are not only being asked to know about the subject at hand, but also to apply

the information in novel situations, think critically about the material, apply the information, and evaluate its appropriateness.

There is no doubt that in the 21st Century the Internet has mastered a wide online learning environment and brought new situations with abundancy of information, growing numbers of teachers and global learning challenges. The new environment allows both – students and teachers – to select the content they prefer, and decide the time and place for teaching/learning which take actions in personalized, mobile, student-driven environment that penetrate the arena from the end of the 20th century and current system education (Mancabelli, 2012).

For some authors there is a need for new didactics (Greenlaw, 2015), some are proposing their own approach in dealing with challenges (Mancabelli, 2012; Open University, 2017). It could be expected that educational arena at all levels – confronted with an awareness that current theories and models are crumbling – should look at new Didactics as a base for overcoming the unwanted and often unpredictable implications of a global network of people and information on education in general, and curriculum, instruction and assessment in particular.

Three components of the didactics framework are present – more or less – in various approaches to modern education. By analysing their similarities and differences, the rational justifications – when selecting an appropriate and useful theoretical framework with respect to a given purpose – could be facilitated. Namely, each didactics framework consists of a) a set of human beings with relations (e.g. students and teachers in a classroom or on a certain learning platform); b) an organisation of human practice and knowledge, and c) a set of artefacts used to mediate and relate the previous two (Winslow, 2010).

There is a number of successful models of teaching and learning that new didactics could emulate and build on (Brown, 2006). However, new approaches are mostly focused on how to exploit ICT and Internet in order to achieve optimal results in teaching/learning processes, for example in open and distance learning (ODL) and design of virtual learning environments (VLEs); on-line study programs and courses; virtual universities, etc. (Ravenscroft, 2001, p. 133). Online learning opportunities result in new players and forms of learning (e.g., MOOCs and globalising university services) and new forms of recognition for skills acquisition (e.g., Open badges). It is also worth of noting that 21st-century learning skills and competencies looked for from the perspective of employers mainly are based on philosophies of communication, collaboration and creativity, as well as on their need to employ workers who will be able to tackle and deal with ever growing challenges in modern economy.

New approaches that aimed at the educational reform called anyway for a paradigm shift to learner-centred domain knowledge learning. In the line with such efforts Marshall, Smart and Horton (2010) suggested that the inquiry-based learning pedagogy could well support learner-centred learning by helping learners to develop inquiry skills, which are an important type of 21st century skill.

Perhaps, the most influential approach and recently more and more criticised was the one based upon so called 21st century skills and competencies. The educational literature features a number of discussions about 21st century skills and learning (e.g., Scardamalia & Bereiter, 2006; Brown, 2006; Walser, 2008; Wagner, 2008; Johnson, 2009; Saavedra & Opfer, 2012).

According to the literature – the following skills are the 21st century skills: literacy, numeracy, scientific literacy, ITC literacy, financial literacy, cultural and civil skills, critical thinking, creativity, communication, collaboration, curiosity, initiative, persistence, adaptability, leadership, social and cultural skills. In addition, Tony Wagner (2008) introduced a so called 21st century seven survival skills: critical thinking and problem solving; collaboration and leadership; agility and adaptability; initiative and

entrepreneurialism; effective oral and written communication; accessing and analysing information; and curiosity and imagination.

After surveying researchers, curriculum specialists, administrators, and teachers, the Harvard Education Letter identified critical thinking, problem solving, collaboration, written and oral communication, creativity, self-direction, leadership, adaptability, responsibility, and global awareness as needed skills for the 21st century (Cramer, 2007; Walser, 2008). However, since there is a lack of usage of scientifically based measures for these skills, it is still felt difficult to infuse them within existing classroom and on-line practices.

Framework for 21st Century Learning, the result of a consensus among hundreds of stakeholders, describes the skills, knowledge, and expertise students need to succeed in work and life. Since 2002, the Partnership for 21st Century Skills has been the leading advocacy organization in the United States focused on infusing 21st century skills into education. In their discussions with the partners about the framework, educators recommended a combination of rigorous courses imparting both core content knowledge *and* skills to engage students and increase achievement. Civic and community groups outlined a set of 21st century skills and knowledge that citizens in a participatory democracy must possess. From the other side, business leaders identified skills and knowledge they perceive as essential for success in the workplace (cf. Johnson, 2009).

Regardless of the skills included or the terms used to describe them, all 21st-century skills definitions are relevant to many aspects of life in today's complex world. Most of these skills focus on similar types of complex thinking, learning, and communication skills. Furthermore, all of them are more demanding for teachers and learners than used to be considered the basic abilities to cope with problems. These abilities are also commonly referred to as higher-order thinking skills, deeper learning outcomes, and complex thinking and communication skills (Saavedra & Opfer, 2012, p. 8). To ease the way these skills might be introduced into didactics frameworks Saavedra and Opfer (2012, p. 11) suggested nine 'rules' which basically frame their didactics model. Following these rules teachers should think how to make their teaching relevant and at the same time permeating across the disciplines, develop of thinking skills and encourage learning transfer. Not less important is to teach students how to learn, work in teams and foster creativity. The teachers should also constantly exploit technology to support learning. Finally, they should address misunderstandings directly to allow students to express their dissatisfaction in cases they feel not comfortable with teacher's approach or communication with them or other students' fellows.

Another approach known as transformative pedagogy has in its focus to encourage teachers to do much more than transmit information. Rather, the transformative pedagogy seeks to "fundamentally and respectfully change students' attitudes and analytic skills to facilitate their growth, regardless of whether the course is delivered through a traditional or online format" (Meyers, 2008, p. 220). Basically, transformative pedagogy aims to critically examine students' assumptions, to explain how they cope with social issues, and engage in social action.

One area that has been addressed in many approaches to modern didactics is the issue of creativity – relating to both, teacher's and student's creativity. The definition of *creativity* is relative to a specific field or context (Amabile, 2012; Gardner, 1999; Mayer, 1999), and basically determines what is novel and relevant. Moreover, creativity refers to a psychological process, related to play, imagination, fantasy, feelings and emotions, meaning making and the use of symbols. As Prensky (2001) claimed, today's students have vastly different interests, skills, and brain functions that are not always recognized or attended to within many contemporary school systems. However, focusing pedagogical designs on creativity is obviously not sufficient to bring innovation in teaching practices.

Number of authors like Prensky (2010), Trilling and Fadel (2009) represent the technophilic approach to modern education. Some others warn about the threat to let educational arena overcome by ICT and to neglect the role of teacher and human values (Postman, 1993; Greenlaw, 2015). In other words, Prensky and his followers intend to provide educators with effective ways to involve their students in experiential learning partnerships through the use of serious gaming, e-books, crowdsourcing, and Facebook; while Postman expressed doubts in relation to taken-for-granted assumptions about the role of technology in education, and warned about the influence of totalitarian technocracy on moral development and cultural identity formation when collective intelligence, hypertexts, and virtual relationships displace traditional textbook and face-to-face modes of learning.

There is another issue which has been brought into focus of modern didactics e.g. the fact that big business has spawned the twenty-first century skills movement in recent years. For example, Microsoft, Google, and Apple encourage educators to make as much use as possible of digital technologies which is based upon the economic interest of these corporations.

Working paper on twenty-first century skills and competencies in OECD countries stresses that "the rhetoric of twenty-first century competencies is seen as yet another facet of an economist approach to education according to which its main goal is to prepare workers for knowledge-intensive economies or even in some cases for particular firms. Instead of putting the emphasis on a harmonious development of all human abilities, the discourse on competencies overstates the relevance of work-related competencies." (Ananiadou & Magdalean, 2009, p. 6). It could be stated that while the 21st century skills movement possesses many pragmatically worthwhile features, its metanarrative of salvation through technology is not balanced in its view of what should count as worthwhile knowledge and pedagogy in today's education (Greenlaw, 2015, p.894-895). Instead of placing too much emphasis upon ICT and power of information, new approaches should sufficiently value the attainment of wisdom in education and focus on role of teacher as an experienced expert who can frame students' learning. As Greenlaw (2015, p.897) wisely notes" teaching is not simply a matter of turning on a computer or an iPad and setting students loose to solve a problem or to do a project".

If we focus on current prevailing opinion and understanding that the knowledge that formed the basis of progress in the 19th and 20th centuries is insufficient in the 21st century, it is necessary to elaborate challenges and possible solutions for future developments in the society as a whole, and in education field in particular. The Industry 4.0 (Botha & Theron, 2016).) is approaching fast and brings in new principles that primarily support the economy and determine the scenarios of their implementation. As one looks at these principles (interoperability, informational transparency, technical support, decentralised decision-making) and their application in a future working environment which will need professionals with competency-based knowledge, communication competence 4.0, ability to develop systems and ability to work with decentralized decision-making systems (Flogie, Barle Lakota & Aberšek, 2018, p. 267-268), it is more than obvious that thorough reform of teacher education programs is needed in order to provide them with a more comprehensive understanding of how cognition, motivation, teaching and learning relates to each other. Moreover, teachers should be able to overcome the bias between technology related goals and humanistic approaches which could enrich the skills and competencies needed and be able to guide learners in a way to soothe technophilic approach and bring in modern education a humanistic dimension.

In the latest Open University report about Innovative pedagogy published in 2017 (Open University, 2017, p. 3) authors discussed innovations that have the potential to provoke major shifts in educational practice. Each trend is rated based on its impact (high or medium) and placed on a timeline for adoption (ongoing, 2-5 years, 4+ years). Immersive Learning, Open textbooks, Spaced Learning, Learning with internal values, Big-data inquiry: thinking with data, Intergoup empathy, Learners making science, Navigating post-thruth societies, Student-led analytics, Humanistic knowledge-building communities.

In recent years several authors critically evaluated didactic models in use. According to Goldman, Cole, and Syer (1999), technology can facilitate deep exploration and integration of information, high-level thinking, and profound engagement by allowing students to design, explore, experiment, access information, and model complex phenomena. They claimed that these new circumstances and opportunities – not the technology on its own – can have a direct and meaningful impact on student achievement. The technology learning versus content learning dilemma necessitates a call for more complex models and experiences for teacher professional development and more materials that support standards-based learning.

This calls for new framework for didactics that could support or even predict educational needs in a near future. It is obvious that in 21st century, the design of innovative teaching practices has been fostered by a vision that creative tasks of students should be implemented in every day teaching methodology and based upon approved didactics which still lacks the data resulting from research projects or scientific analysis of the complex educational arena.

Up to now research has been verifying the value of information and communication technology in the education systems worldwide. It has demonstrated that ICT can:

- reduce learning barriers (e.g. Rose et al., 2002),
- improve academic success (e.g. Wenglinsky, 2005),
- increase student chances for learning success (e.g. Slavin, 2005),
- create a greater sense of adaptive communication and school community (e.g. Zhang, Scardamalia, Lamon, Messina, & Reeve, 2007), and
- provide greater opportunity for flexible access to learning (e.g. Palloff & Pratt, 1999).

Some authors investigated specific areas of their interest, such as Ghislandi and Facci (2013) who were interested in teachers' training role in the innovative use of the Interactive Whiteboard; Guo and Wouflin (2016) who surveyed in how the 21st-century learning framework reflects principles of creativity. Their study was based on a qualitative analysis of the Partnership for 21st Century's (P21) policy documents, with a specific focus on how the principles of creativity, one of the 4Cs (creativity, critical thinking, collaboration, and communication) of the P21 learning framework, are reflected in these documents.

Cobo (2013) explores and discusses key conditions needed to develop skills for innovation by analysing five trends that can contribute to fostering the development of skills for innovation within and outside formal educational institutions.

Flogie, Barle Lakota and Abversek (2018) addressed the intense introduction of ICT that accords with educational trends and the requirements of today's society, but which sometimes neglects social competences and any potential psychosocial effects. A need for new and effective methods in upbringing and education to offer everyone, equal opportunities become more and more important in the "world of the 21st century". The research also proved that innovative didactics methods of teaching (4.0) using a transdisciplinary model and supported by state-of-the-art information and communications technology as well as cooperative learning, has a positive psychosocial effect on science, technology, engineering and mathematics (STEM) students.

Finally, in this overview the number of books dedicated to the new pedagogy and didactics should be mentioned. Griffin and Care (2015) edited a book which starts from the presumption that new paradigms, demands and needs, have significantly influenced learning and teaching, but left assessment domain almost untouched. The book reflects these by emphasising new educational principles which include: the use of technology in order to develop information and communication literacy; ways of thinking like creativity and innovation, critical thinking, problem solving and decision making; new ways of working through communication and collaboration; ways of living in the world such as citizenship (local and global), life and career and personal and social responsibility—including cultural awareness and competence.

3. Learning Styles and Other Related Constructs

By Polona Vilar

Different information is needed for quality teaching, including that on users and their characteristics. This is the basis for understanding of their action patterns, ways of thinking, learning (Johnson-Laird, 1983). Within the framework of the cognitive paradigm in information science (e.g. Vakkari, 1994), it is examined which human factors are involved in the use of Information Retrival (IR) systems, how to determine them, what their role is in the use of IR systems, and how the identified individual characteristics can be taken into account when designing IR systems or teaching their use. Similar issues arise when thinking about teaching in general. In addition to knowledge of interaction with information sources, consideration of cognitive concepts such as thinking styles can also improve understanding of the use of information and the formation of new knowledge (Todd & Southon, 2004). Here we often talk about concepts in the field of personality traits and the characteristics of cognitive activity (cognitive, learning, thinking styles). Cognitive factors are commonly referred to as those variables that can explain the differences in the behaviors of individuals in learning situations. Ingwersen (1984, 1996) also mentions many cognitive processes that appear in IR processes, e.g. perception, memory, recognition, learning and problem solving. Researchers (Bawden & Robinson, 2015) also mention the concept of the information style, and also state that all these constructs are increasingly used by the umbrella term 'intellectual style'.

The IR process, as an element of the learning process, is often also addressed in terms of more complex processes related to cognition, such as, problem solving (see Ingwersen, 1984; Wilson, 1998; Gaslikova, 1999; Lueg, 2002), or creativity that is part of problem solving process (eg. Kulthau, 1998; Ford, 1999). Problem solving is often defined as cognitive activity, the initial phase of which is the identification of the existence of the problem, and includes the steps that an individual is pursuing to achieve a solution or goal. It is therefore concerned with the search and use of resources, knowledge and methods available to the individual to achieve a particular goal (Evans, 1995). Problem solving is related to decision-making (selecting a particular solution from a variety of potential solutions), judging (an integral part of decision-making, where an individual assesses on the basis of available information the likelihood of occurrence of certain events) and inference (derivation of conclusions based on available information) (Case, 2016). In case of creativity, similarly complex cognitive activity, in addition to the processes described above, we also encounter originality (the creation of novel or different ideas or solutions). In addition to originality, the characteristic of creativity is also usefulness of solutions (Eysenck & Keane, 2005).

Borgman (1989) was among the first to identify individual differences (personality traits, learning styles) as influential factors in information retrieval, whichstrongly influenced debate and exploration of individual differences, in the contexts of IR systems, WWW, and information behavior (Chen & Rada, 1996). Her second important finding is related to the experience with computers. These are strongly linked to the consistency of individuals' behavior in IR. Users with more experience usually search more efficiently, regardless of their other personality or cognitive characteristics. Based on this, Borgman concluded that the user differences are predictable enough to be taken into consideration at two levels:

- through the education and training of users,
- by design of systems and user interfaces, which takes into account the characteristics of the target audience, and emphasizes the usability and user-friendliness.

We will describe some models of personality characteristics that are common in the field of information science. Agada (1998) attempted to profile librarians with Myers-Briggs Type Indicator (MBTI) (Myers,

1978). Palmer (1991a, 1991b) combined the model of personality characteristics and the model of learning styles. Kirton's (2003) model adaptor-innovator, which identifies two properties, was used to determine the personality traits. Adaptors are characterized by the ability to adapt, adhere to rules, and focus on systematic and successful performance of tasks. Innovators, on the other hand, express lower flexibility, innovation and unsystematic performance. It is necessary to note that Kirton's model is also considered as a model of cognitive style, but according to Kirton (2003), it is associated with personality traits that occur early in life and are relatively stable. The study also included the model of learning styles Honey and Mumford (1986), which was also used by Borgman (1989); it identifies four learning styles: activists (individuals who learn best through activity), theoreticians (who prefer learning through literature), pragmatics (individuals who prefer testing) and reflectors (who prefer to think about activities only). Palmer found that individuals identified as innovators and activists usually have a wider approach to finding information, approach work with greater enthusiasm and use a wider variety of sources. Adapters and reflectors are more subject to social pressure and authority, they are inclined to conformity and have more doubts in their abilities, while in IR they are more systematic and methodical.

Heinström (2000, 2003) attempted to link the Big Five model (Revelle & Loftus, 1992), which consists of five bipolar dimensions (emotional stability, energy, openness, acceptance and conscientiousness) with learning modes and are consequently, as she claims, closely related to learning styles. An individual may express a high or low level, or is more or less inclined to one of the two poles of each of the five dimensions. The dimension of emotional stability describes the sensitivity to external stimuli and the level of emotional control. Individuals with a low level of emotional stability are more sensitive and react more emotionally than those with a high level. The energy dimension indicates the nature of an individual: open and social, or rather closed and reserved. Openness measures the depth, breadth and variability of the individual's imagination and the desire to experience things. Acceptability is associated with altruism, emotional support and care for others in contrast to competition, hostility, indifference, focus on self and jealousy. Consciousness measures the focus on achieving goals and the scope of control over stimuli. It is linked to educational achievements. Heinström found that each of the studied dimensions is in a certain way related to the approach to IR, but nevertheless acknowledges the connection with other factors, such as, for example, cognitive and emotional factors. On the basis of personality factors, she identified three types of 'search behavior': fast surfers, broad-viewers, and deep divers. The first is characterized by a surface approach, relatively high emotions, a low level of consciousness and an openness for experiencing. The broad viewers are described by extrovertness, openness to experience and competitiveness, and deep divers by an analytical, in-depth and strategic approach. The significance of her study lies primarily in the identification of personality traits as factors in individual patterns of behavior in inquiry.

3.1. Cognitive and Learning Styles

More attention is placed on factors and models in the field of cognitive activity, especially cognitive, learning and thinking styles. Cognitive styles can be defined as types of human information processing, while learning styles denote the use of cognitive features in learning. In the field of cognitive psychology many authors have dealt with the concept of style (see for example, Riding & Cheema (1991); Grigerenko and Sternberg (1995)). The investigation of cognitive styles belongs to the field which studies perceptive processes, such as perception, inference, memory, etc. These are "hypothetical constructs that have been developed in order to explain the relationships between stimuli and responses" (Magajna, 1995).

In connection with information science, the most common are the styles of the holistic-analytical dimension (eg. field dependence/independence (Witkin & Goodenough (1981) or holist/serialist (Pask & Scott, (1972), Pask (1976)), we also encounter studies which use verbalizer/imager dimension – model Cognitive style analysis (Riding, 1991)). Cognitive styles, in general, as well as in information science, are often connected with learning effectiveness or learning experiences (Beddoes-Jones, 2005; Bernardo, Zhang & Callueng,

2002); Chen & Macredie, 2002), use of information systems etc. (see Ford, Wilson, Foster, Ellis & Spink, 2002; Chen & Ford (1997); Ford & Chen (2001), Palmquist & Kim (2000), Reed et al. (2000), Wood, Ford, Miller, Sobczyk & Duffin (1996), Ford & Miller (1996), Wang, Hawk & Tenopir (2000)).

Tennant (1988), who was later cited by many others (eg. Riding & Cheema, 1991, Sternberg, 1997a), is one of the first to describe cognitive style as a typical or permanent way of solving problems, thinking, perception and memory. Cognitive styles are usually considered as relatively consistent and permanent individual characteristics, pertanining to the perceptive organization and functioning of an individual, especially in the way they accept, preserve, process and organize information, and solve problems on their basis (Magajna, 1995). Cognitive styles express wider dimensions of personality activity and include emotional and motivational factors. Researchers (see, for example, Riding & Cheema, 1991) divide models of cognitive styles in two groups regarding to two basic dimensions: holistic-analytical and verbal-representative. These two basic dimensions structure the way in which people process information and perceive the whole or individual components (holistic-analytical dimension), and perceive information or think in words or images (verbal-representative dimension).

Cognitive style field dependence/independence means an individual's ability to overcome embedded contexts in the perception domain, or to separate parts from an organized whole (Witkin, Goodenough, 1981). With regard to perception, this does not only mean the visual field, but also the individual's auditory, tactile, social functioning or their functioning as a whole (Peklaj, 1995a). Peklaj also states that field independent individuals can overcome the entire organization of the perception field, and extract and reorganize individual parts. Field dependent persons perceive the field as a whole and are also less concerned with its composition, they take it as given. According to Ford (2000), the Pask model of holistic-serialistic thinking (Pask & Scott, 1972, Pask, 1976) is also interesting in the context of IR systems and virtual environments. According to Pask, holists in learnign situations strive for a global and conceptual way of information processing, while serialists turn to superficial and sequential ones. If we look at the mental structure that an individual is building in information processing, in the context of mental models, we find that the holistic way of information processing is linked to a mental structure based on the description of the elements, and the serialistic one with a process-based approach (Ford , 2000).

Another interesting model is the Cognitive Styles Analysis (Riding, 1991, 1994). It measures the individual's inclination to visual (perceptual) thinking, which is also characterized by holistic processing of information, or verbal (text-oriented) thinking, where individuals process information analytically or sequentially. An example of the research is the studies of Ford, Miller and Moss (2001, 2005a, 2005b), which linked a visual cognitive style with lower efficiency or less success in inquiring, and later (2005a, 2005b) revealed the links between the representational orientation and the preferences of pre-set structures, such as query forms.

Another important area, as already mentioned, is experience. It has long been known that different levels of knowledge on topics, information technology or inquiry affect the differences in information behavior and learning. A number of studies have been reported (see eg. Borgman (1989), Holscher & Strube (2000), Lazander, Biemans & Wopereis (2000)). In the context of individual differences, it is found that experience somehow covers the cognitive style. Researchers (eg. Palmquist & Kim, 2000, Kim, 2001a, 2001b, Reed et al., 2000) found regarding cognitive style field dependence/independence, individuals who are more experienced do not express their style of field dependence/independence as distinctly as inexperienced ones. All experienced users spend approximately the same amount of time for successful completing of search tasks, while for inexperienced users it is characteristic that field dependent need more time, take more steps and generally have more difficulties to navigate in the database environment. This means that appropriate education can influence individual differences or somehow neutralize their influence on the learning process.

Applications of cognitive-style models in various professional contexts or in concrete learning situations, produced theories of styles based on activity and learning (Rayner & Riding, 1997). These constructs are often called learning styles (Keefe & Monk, 1986). The difference between cognitive and learning styles is that learning styles are usually applications of cognitive-style models to a particular learning situation or environment. In the field of information science, process-oriented models of learning styles are the most commonly used, such as The experiential learning style (Kolb, 1976, 1984), Approaches to learning (Entwistle, 1979, 1981), and Honey and Mumford style (1986, 1992).

Teaching styles are defined (by eg. Marentič-Požarnik, 2000, Marentič-Požarnik, Magajna & Peklaj, 1995, Sadler-Smith, 2001) as typical combinations of learning strategies that individuals usually utilize in most learning situations. In certain situations, these strategies are more, and in some cases less appropriate and efficient. In addition to strategies, defined as combinations of mental operations that individuals use in a concrete learning situation, learning styles also include emotional-motivational components (goals, intentions) and perceptions of learning (mental learning model) (Marentič-Požarnik, Magajna & Peklaj, 1995). They are among the predictors of learning success, as are the styles of thinking and some other factors (Letteri, 1980; Genovese, 2006).

Entwistle (1979, 1981) designed the model of learning approaches to determine the factors influencing the results of learning. He tried to combine the individuals' preferences regarding instructions and ways of their information processing, to designe a model of learning style with four aspects or orientations: sense, reproduction, achievements and overall orientation. Entwistle's integrated concept of the learning process attempts to describe activities related to specific learning strategies.

Marentič-Požarnik (1995a) writes that this is not a permanent personality trait, but for students to choose and apply different approaches according to their perception of the task, interests, motivation, difficulty of study, amount of substance, stress, stress. In addition, he also points out that it is not possible to choose a better, more successful or more suitable one from these approaches, since this is partly dependent on the profession, the inclination to extremes, the specialization of the individual and other factors.

Among the approaches used by the individual in studying are thus included (Peklaj, 1995b):

- *focus on achievements*: It is characterized by a good sense of organizing learning, competitiveness and a desire for achievement.
- *Orientation to sense and meaning*: Such individuals have a distinct internal motivation and in-depth approach to learning.
- *Orientation to reproduction*: Such individuals learn mechanically, by heart, that is, they are characterized by a surface approach, external motivation, and concentration to study requirements.
- *Integrated approach*: These individuals learn comprehensively, are focused on understanding and connecting, as well as quickly forming conclusions.
- *Sequential approach*: Such individuals are characterized by logic, attention to detail and caution in concluding.
- *Elastic Approach*: These individuals also indicate the orientation towards logic, and also the search for sense and meaning, as well as understanding and connecting.
- *Unsuccessful approach*: It denotes focus on memorizing and the premature and careless conclusions.

Of course, every individual expresses a different tendency towards each approach or dimension, and of course also uses different combinations of approaches. On the basis of some of them, an additional dimension can be formed: *study success prediction*, which is a combination of an elastic approach and good study habits without elements that influence the bad learning outcome. According to Entwistle (1981), on the basis of different combinations of approaches, students can be divided into three groups:

- Students with deep-rooted approach: They focus on sense and meaning; they are driven by personal interest, teacher's or external requirements are not essential to them. They use a deep or holistic approach, deeper understanding, make connections and try to refine the topics and use their own interpretation, as well as flexibly adapt their learning to external circumstances.
- Students with surface approach: They are characterized by orientation to memorizing and reproducing the materials in the same form as they are presented, external motivation is essential, such as the one determined by the teacher or the environment. This motivation is often also negative, or associated with fear of failure. These students tend to use superficial, serialistic approach that does not create durable knowledge structures.
- Students with strategic approach: They are oriented towards achievements and productivity, that is, the highest possible performance and the best possible results. Their motivation is production-oriented. Such students carefully choose approaches to learning, or flexibly combine activities from the first and second group, depending on how they assess their usefulness or benefit. It is therefore a productivity oriented approach.

Entwistle and colleagues (Entwistle, Hanley & Hounsell, 1979) developed Inventory of Approaches to Studying and later a shorter version, the Short Inventory of Approaches to Studying (Entwistle, 1981). The latter is used in most research in information science.

In studies that take into account learning styles, we see similar conclusions, as in the case of cognitive styles, which is understandable, as learning styles are based on cognitive styles (see eg. Ford & Walsh, 1992; Ford, Wood & Walsh, 1994; Ford et al., 2002). It has been found that holistic individuals more often use methods that enable them to have a global overview (such as graphic representations), while serialists use text-based and sequential methods (dictionaries, menus). Similarly to cognitive styles, there is also a link between an analytical learning style and a more precise, more focused and more active approach (Wood, Ford & Walsh, 1992; Ford, Wood & Walsh, 1994; Ford and others, 2002). Analytical individuals do not prefer pre-prepared query techniques, but they create their own approaches and use advanced search approaches. Holists are characterized by diffuse behavior and greater sensitivity to external factors, and more frequent use of communication.

From Entwistle's model, we see that analytical kearning style is also associated with serialistic, more surface and reproductive-oriented approach. This is the opposite of an approach aimed at creating sense and meaning, which is more commonly used by holistic people. For example, Ford, Miller and Moss (2003) report that users, who prefer to search using tools such as lists of keywords or descriptors, often have a reproductive approach to study, feel concern (fear of failure) and a high level of active interest. The construction of own queries was typical for individuals with lower levels of concern, as well as lower levels of active interest, but who were more focused on creating meaning and, therefore, more holistic. Combined IR approaches were typical for individuals who, in learning are less good in time-allocation, thus expressing an unsuccessful approach to learning.

Saracevic and Kantor (1988a, 1988b) used Kolb's model of learning styles. His model of experiential learning consists of elements that emerge from two dimensions of cognition: perception, based on concrete experience, and understanding, based on abstract-logical thinking, and on the other hand, active operation in the outside world and inward-oriented thinking observation. Four ways of learning are thus: concrete experience, thinking observation, abstract conceptualization and active experimentation (Marentič-Požarnik, 1995b). Saracevic and Kantor found that individuals who learn by ways of "concrete experience" are more likely to express their information needs more accurately and precisely already in the beginning. This means that such individuals can choose more relevant search terms more easily and quickly. However, the authors also found that in case of failure they are less flexible in the following steps. On the other hand, the greater inclination of individuals to "abstract conceptualization" means that they need longer time to

select appropriate search terms and to form appropriate queries, but in the subsequent phases they can more easily adapt their work in order to find relevant informstion.

3.2. Thinking Styles

Thinking styles are a relatively new construct, introduced only at the end of the twentieth century. In the field of information science, it is not so common (used by eg. Golian, 1989; Hommerding, 2002; Vilar & Žumer, 2008). The study of thinking styles has roots in attempts to understand the source of misunderstandings among people (for example, members of a particular working group), who, as Kirton (2003) points out, "did not think in the same way", they had misunderstandings in communication, and consequently their joint work was not successful. In the eighties, in the field of communication and psychology, there was a realization that people use different patterns of expectations, goals, approaches and assumptions in communication, while at the same time assuming that others are thinking in a similar way. The result of such often wrong assumptions was intolerance, impatience, abuse, frustration, ineffective communication, and poor quality relationships among individuals. The phenomenon was called the "conflict of thinking styles" (Kirton, 2003). On this basis researchers began to study patterns or ways of thinking and differences between them.

The first research in this field focused on the neurological basis of thinking, or the function of brain hemispheres. Torrance and dr. (1977, 1983, 1987) link the "left hemisphere style" to information processing in a conceptual, sequential and analytical way, and the "right hemisphere style" by processing it in a direct, experiential and holistic way. In the section on hemisphericity, we also present the concept of learning and thinking styles designed by Torrance and colleagues and is based on the functioning of brain hemispheres. Afterwards, there were many warnings that things are in fact more complex and that the functioning of the brain and the differences between the styles of thinking can not simply be attributed to physiological activities in the brain hemispheres; there is merely an indirect link (Zalewski et al., 1992, Springer & Deutsch, 1981; Canoe-Garcia & Hewitt-Hughes, 2000).

Theory of Mental Self-Government

A widely documented and scientifically based approach to thinking styles is Sternberg's Theory of Mental Self-Government (1988, 1997). Sternberg (1997a) derives from the problem-solving process and argues that the individuals' thinking style is the preferred way of using their abilities. It affects how a certain activity fits a person, or even how certain people fit or don't fit them. Because of the uniqueness and particularity of the individual's thinking style, Thier (1988) compared it with a fingerprint. Sternberg highlights reciprocity and interactivity between the individual and the environment. The individual is shaped by the environment, and the individual also shapes the environment. Later studies (eg. Zhang, 2005) confirm that styles can not be studied in isolation from the environment or the situation.

We can notice differences between Sternberg's definitions and theories of cognitive styles. Marentič-Požarnikova (2000), Magajna (1995), Witkin et al. (1977), Messick (1984) and others define cognitive styles as relatively consistent and lasting traits of an individual in the way he receives, maintains, processes and organizes information and solves problems on their basis. Sternberg's definition of thinking styles, however, suggests that styles are variable and can be learned. Similar to intelligence, they can be the result of an individual's environment, and therefore related to culture, sex, age, education, etc. Sternberg argues that styles are not abilities, they act as intermediaries between abilities and personality. The individual does not have one style, but a profile composed of different styles, some of them more and the others less pronounced.

The characteristics according to which the Theory of Mental Self-governance is fundamentally different from the predecessors are (Zhang, 1999b, Zhang & Postiglione, 2001):

a) it is a multi-dimensional model, in contrast to most of the previous theories proposing one-dimensional models
b) the styles it describes depend on time, tasks and circumstances,
c) they also depend on socialization, which means that, unlike cognitive styles, they are not inborn and relatively permanent.

In the theory of mental self-government, Sternberg (1997) divides the ways in which people organize, direct and manage their mental activities in categories according to certain characteristics. He proposes 13 thinking styles that fall into five dimensions of mental self-government: functions, forms, levels, extent, inclination.

1. Functions of thinking styles: legislative, judicial and executive style
   Functions of thinking mean how individuals use their thinking abilities.
   - Legislative style: setting up their rules, creativity, design and planning, deciding and selecting, preference of unstructured problems, inadaptability (because of which individuals sometimes get into conflicts in educational and organizational environments which often do not encourage legislative style)
   - Judicial style: preference of activities that enable the analysis and evaluation of the work and ideas of others.
   - Executive style: following already defined rules, preference of structured problems and instructions on how to perform a specific task, usually also good performance (which makes this style very often highly appreciated in educational and organizational environments).
2. Forms of thinking styles: monarchic, hierarchic, oligarchic and analytical style
   It is about how individuals see and evaluate the problems and goals that they want to achieve.
   - Monarchic style: focusing on one single goal or problem, very strong motivation and non-recognition of obstacles, lack of interest in problems unrelated to this goal, search for the culprit in external circumstances. The inclination to this style does not change, regardless that the individual's goals can change.
   - Hierarchical style: motivation based on priorities, classification of goals in the hierarchy, and more motivation for those goals which are higher in it, systematic and organized approach to solving problems and making decisions, awareness of the complexity of problems and the ability to see situations from different angles, which makes it easier to judge and sort problems. Individuals are, as a rule, very popular in their work, because these tend to appreciate the ability to organize and systematize in the workplace. The problem arises when the individual's hierarchy of objectives differs from the priorities of the organization, because they only reluctantly agree and prefer to organize the work according to their own priorities.
   - Oligarchic style: somewhat similar to the hierarchical, because both of them are dealing with several situations or problems at the same time, but this one is about perceiving more problems as equally important and therefore making it difficult to decide how much motivation and activity to devote to each one, which often causes time pressure, and external advice is often needed for successful completion of the task. The style is not expressed if there is enough time or resources to complete the task.
   - Anarchic style: random approach to solving problems, dealing with many goals and needs, but in solving them disregard of the system, consistent rules, or established scheme - this does, however, not mean being unsystematic, only opposition to every outside-imposed systematicity. It also includes great creative potential and very original ways of the integration of ideas and information. That is why individuals often come into conflict with the environment and are, as a rule, least popular in working organizations, and for successful work they must learn self-organization and self-discipline.

3. Levels of thinking styles: local and global style
   The level of thinking styles means to what the individual is directed, or what they focus on in a particular situation. To some people details are more important, while others focus on the whole picture.
   - Local style: preference of concrete problems that in order to be solved require dealing with details, reality and orientation to pragmatic solutions.
   - Global style: the preference of wider problems and relatively abstract topics.
4. Scope of thinking styles: internal and external style
   The scope of thinking styles means how the individual experiences the environment and the world, how he responds to it, what situations they seek or create and what kind of experience they accumulates on their basis.
   - internal style: introvertness, focus on tasks and less social sensitivity (difficult to deal with the outside world and making contacts), occasional expression of a small degree of interpersonal awareness, preference of independent work and individual engagement with things and ideas.
   - external style: intense awareness of the environment and other people, extrovertness, orientation to people, accessibility, social sensitivity and stronger expression of interpersonal awareness, preferences of working with people, performing tasks in society and in cooperation.
5. Leanings of thinking styles: liberal and conservative style
   The leanings of thinking styles is about how much the individual rules and operating modes are appropriate for the individual.
   - Liberal style: preference of situations where work can be done in own, previously unused way, the desire for changes and situations, which are somewhat vague and ambiguous, avoidance of precisely prescribed procedures and existing rules for performing tasks, rapid loss of interest.
   - Conservative style: preferences of established circumstances, structured and predictable environment, following instructions and observing existing rules and procedures wherever possible, avoiding vague situations and circumstances, rejecting changes.

It is also possible that an individual expresses a stronger inclination towards one of the dimensions of a particular group, and weaker to others. This particularly applies to levels, scope and leanings that are bipolar. Sternberg also argues that an individual can compensate for a lack of a certain style by working with those who prefer it. For example, individuals with legislative and executive law work well together, as well as those with legislative and judicial style. Individuals with a legislative style contribute to planning, those with judicial deal with evaluation and selection, and those with an executive to realization. Someone who likes to think globally, works well with someone who is paying attention to detail. Otherwise, people prefer to work with those who are similar to them, but they are more likely to gain from those who process information in a different way because overlap can cause too much information to be lost or overlooked. Different styles are needed for successful work of a particular organization. Of course, one individual can combine two or three different styles, but they usually feel best in one role.

In the case of individuals with different types of thinking styles, the above-mentioned conflicts also often occur. Individuals with a monarchic style are often considered rigid and unprepared for compromises. Individuals with an oligarchic style are reluctant to recognize the importance of one goal before others. Individuals with a hierarchical style prefer a certain degree of order, so they are disturbed by individuals with an anarchic style who do not need order. It is therefore important that people are aware of these differences and try to achieve greater work performance by taking them into account and exploiting the positive potentials of each individual. Styles are not good or bad, it's only about different uses in different circumstances (Sternberg, 1997a).

It is important to note that thinking styles are very often confused with abilities. It also means that certain environments promote certain styles of thinking, while rejecting others (for example, according to social values, gender, etc.). For this reason, it often happens that individuals whose thinking style is not appropriate for a particular environment or does not match the assessor's style wrongly think that their

abilities are defective or they perceive themmselves as incapable. It is therefore important to match thinking styles and individual's abilities. Individuals who we identify as gifted are mostly those whose thinking style corresponds to their abilities. Successful work of an individual depends on how well they combines both aspects, how he thinks and in what way he thinks well.

The described dimensions of thinking styles are also divided by certain researchers according to the complexity of the mental processes (Zhang & Sternberg, 2000, Zhang, 2004a, 2004b, 2004c):

1. Type I thinking styles (more complex thought processes, styles oriented towards creativity): legislative, judicial, liberal, hierarchic, global style).
2. Type II thinking styles (less complex mental processes, styles that favor norms): executive, monarchic, local, conservative style.
3. Type III thinking styles ("neutral", expressing the characteristics of types I and II, depending on the current task): anarchic, oligarchic, internal, external style.

In order to determine the thinking styles, Sternberg designed the Thinking Styles Inventory. It is a self-assessment questionnaire, in which the individual assesses the favorite way of performing a specific task in a given situation. Sternberg later shortened and adjusted the questionnaire with the help of Wagner (Sternberg & Wagner, 1992) to determine only certain styles or dimensions. With this, he showed that the questionnaire can be adapted to the purpose of the research and to omit certain dimensions of thinking styles, which was later used by other researchers (eg Sexton & Raven, 1999, Zhang, 1999a, 1999b).

Hemisphericity

We have already mentioned some researchers (eg. Torrance and colleagues) who investigated structure and functions of thinking, attempting to link thinking or learning styles to the brain hemispheres. They have defined different ways of learning and thinking using terminology pertanining to specialized functions of individual brain hemispheres. On this basis left-hemispheric, right-hemispheric and integrative thinking and learning styles were formed (Peklaj, 1995b).

Peklaj warns that in the case of hemisphericity or lateralization of functions it is only possible to relatively (not absolutely), especially because the brain functions as a whole and in most activities both hemispheres participate. However, it can happen that in certain activities one hemisphere takes over control. Peklaj (1995b, p. 172) defines lateralization as "a process in which different functions and processes become connected with one or the other brain hemisphere, and the end result is the dominance of the individual hemisphere in control of certain processes." The functioning of the left hemisphere is connected with analytical, logical, objective thinking, linear and sequential processing of information, and in particular with linguistic and mathematical activities. The right hemisphere is primarily active in synthesizing and connecting, perceiving and identifying sounds, accepting sound and visual stimuli, body sensations, and interpreting and expressing emotions.

Regarding which brain hemisphere is more involved in learning, three learning and thinking styles have been formed (Peklaj, 1995b), left-hemisphere, right-hemisphere and integrative style:

- Left hemisphere style prefers verbal instructions and information, use of language and text in learning, orientation to details and data. An individual better remembers texts, learns in a sequential, systematic way, according to a certain plan, solves problems analytically.
- Right-hemisphere style means that an individual prefers visual and/or kinesthetic instruction, learns through research, likes metaphors, analogies, demonstrations, movement. Such individuals memorize with the help of the presentations and images, and process information in patterns, as a whole, problem-solving is intuitive. They produce new thoughts, ideas, like art, poetry, well interprets non-verbal communication, emotions, and have no problems with expressing feelings.

- Integrative style means that the individual does not give priority to any of the ways of learning, or can use them equally. They are not explicitly oriented either to the left-hemispheric nor to the right hemispheric style of learning and thinking, but more equally uses both hemispheres.

In teaching or school work these differences between individuals should be taken into account. The school is supposed to offer a balanced mix of subjects and topics, and should, in addition to the "traditional" traits such as memorizing, also promote features such as creativity, imagination, ability to synthesize, etc. (McCarthy, 1987). McCarthy also recommends varied ways of instructing, various learning activities and assessment methods, which also take into account more right-hemisperical individuals.

With a questionnaire on learning and thinking styles, designed by Reynolds, Kaltsounis and Torrance (1979), we measure the perceptions of how much individuals prefer to use one or another way of learning or thinking in a given activity.

3.3. Links Between Individual Characteristics and Chosen Work Field or Discipline

The literature also discusses the interrelationships and influences of factors such as personality traits and tendencies, cognitive orientation or cognitive, learning or thinking style, experience, preference of a particular activity or field. Each of these factors affects others in a certain way. It is difficult to talk about whether the choice of a profession or field of work is a consequence of the individual's characteristics or is field of work a factor that influences the development of certain individual characteristics while blocking others. However, it is fact that in the case of members of a particular profession it is possible to discover similar individual characteristics.

We have already shown that Sternberg (1997) speaks of the preference of certain activities in conjunction with the favorite dimension of thinking style. We have also talked about Kolb's learning styles and mentioned four different learning styles, which arise from different preferences within a concrete-abstract and active-reflexive dimension: convergent, divergent, assimilative and accommodative learning style. His research (Kolb, 1981, 1984) is also interesting because he writes about the factors of the formation of the learning style and, as the most influential, identifies the school specialization and the subsequent entry into the profession. In the school specialization, the choice of the study field (humanities, social sciences, natural sciences, technical field) is influential in the development of either convergent (engineering and medical students), divergent (students of psychology, history, literature), accommodative (students of entrepreneurship) or assimilative (students of mathematics, chemistry, sociology and economic theory) learning style. As shown in Figure 1, the profession or activity that the individual is engaged in is influenced by the fact that certain professions require certain ways of thinking and learning (Kolb, 1984, p. 127). A similar division can be found in the discussions of Požarnik (1990, 1995). At the same time, the more detailed professional orientation within the chosen profession is also important, as Kolb discovered in the case of medicine: the researchers have assimilative styles, family doctors tend to be accomodative, psychiatrists divergent, and specialists more convergent.

Studies of other learning styles also indicate their relations to the chosen field of study. Entwistle and Ramsden (1983) identified two extreme types of learning styles that they called a deep or global approach and a surface or atomistic approach. They also discovered the link between learning style and courses that individuals choose to study. Students with a surface approach tend to choose studies where knowledge is hierarchically structured and linked to accepted paradigms (such as natural sciences, computing, engineering, and engineering). Globally oriented individuals are attracted to those sciences, where knowledge is more subject to subjective interpretation (such as social sciences and humanities). In some

information science studies, certain links of learning styles and selected professions were also identified (eg Borgman, 1989; Vilar & Žumer, 2008).

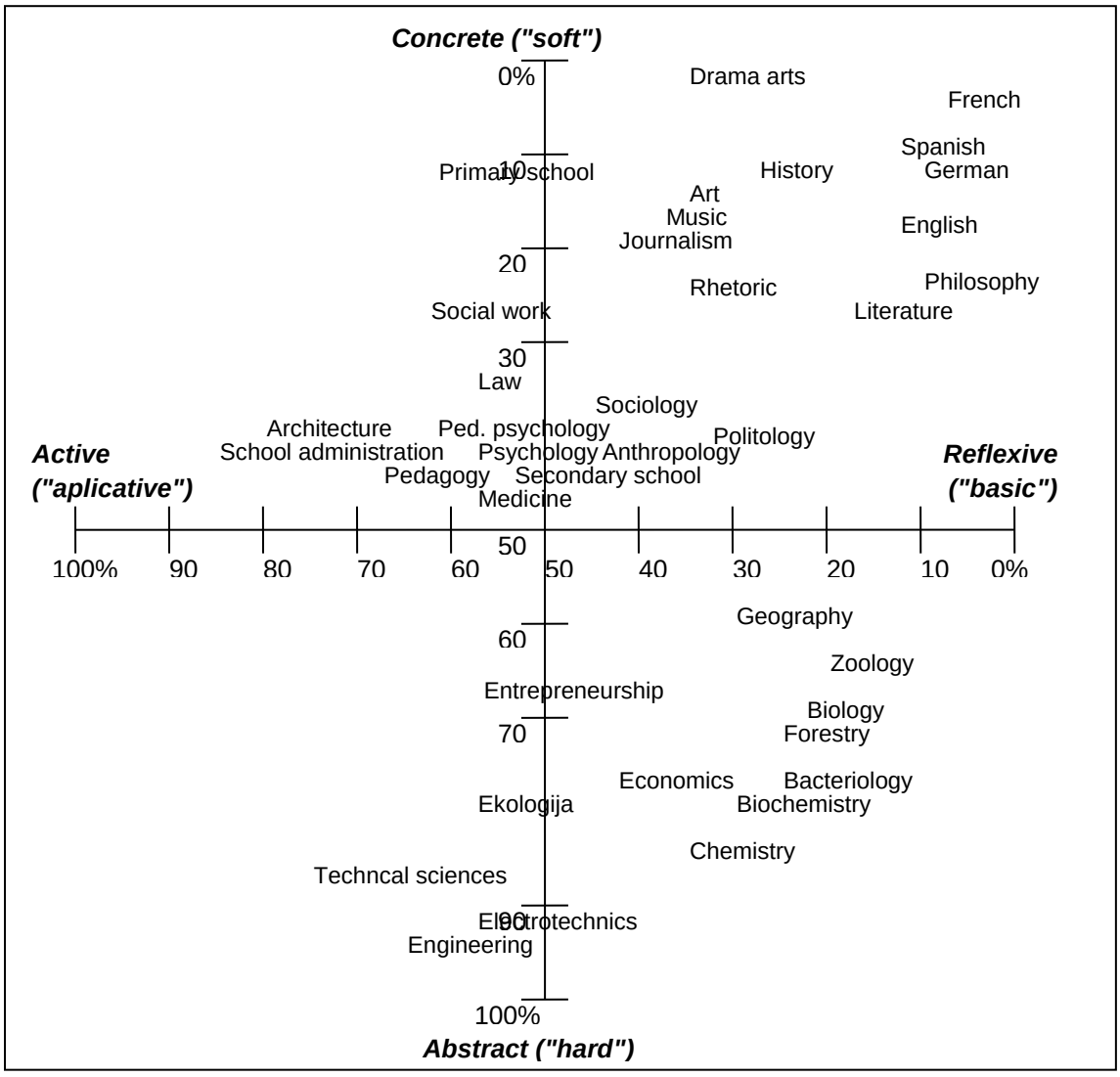

Figure 1: Division of various dicsiplines and professions in Kolb's learning styles space (Kolb, 1984)

4. New Instructional Trends

Instructional Design is about how to plan, develop, evaluate and manage the instructional process effectively to ensure improved performance by learners. The goal is to understand how people learn and how to best design instructional systems and instructional materials to facilitate that learning. Selecting the delivery systems and teaching methods is an essential part of it. There are numerous instructional methods to select from. Here we will focus on the most recent trends.

4.1. Blended Learning

By Serap Kurbanoglu

Although the literature revealed several definitions, blended learning is commonly defined as a combination of the traditional face-to-face and technology-based instruction delivery methods (Porter et al, 2016; Olitsky & Cosgrove, 2016; Spanjers et al, 2015; Rahman, Hussein & Aluwi, 2015; Graham, 2013; Grassian & Kaplowitz, 2009). In other words, blended learning is a form of education that takes place both online and in a physical classroom. Rather than replacing face-to-face lecture delivery with online delivery, in blended learning the online component is usually used as a complement of the in-class lesson. By combining the delivery modes of teaching, blended learning is assumed also to combine the advantages of both methods, and therefore to be more useful to students (Rahman, Hussein & Aluwi, 2015; Feist et al, 2013; Vernadakis et al., 2012). Blended learning is often also referred to as a hybrid model. The ultimate goal of which is to promote active and self-directed learning opportunities for students by joining the best features of face-to-face in-class instruction with the best features of online instruction.

Blending has become a common delivery mode in education (Olitsky & Cosgrove, 2016; Porter, Graham, Bodily & Sanberg, 2016; Ross & Gage, 2006; Norberg, Dziuban & Moskal, 2011). An increasing number of institutions are adopting blended learning and it is in the mainstream of higher education (Picciano, Dziuban & Graham, 2013; Garrison & Vaughan, 2007; Bonk, Kim, & Zeng, 2006) as well as K-12 education (e.g., Picciano, Seaman, Shea, & Swan, 2012). Allen, Seaman and Garrett (2007) noted that almost half of the HEIs had blended learning offerings. Another survey found out that 80 percent of all HEIs and 93 percent of doctoral institutions in United States offer hybrid or blended learning courses (Arabasz, Boggs, & Baker, 2003). Although there seems to be a mismatch between these figures both indicate a high percentage of usage almost a decade ago. Blended learning today is a well-known technology-based approach used in education. Tools and technologies often used in blended learning are content management systems, such as Blackboard and Moodle along with podcasts, lecture capture, online chat, and discussion boards (Lyons & Evans, 2013).

A blended learning strategy, by incorporating in-person instruction with online instruction (typically Web-based), can increase student engagement, improve learning outcomes and student retention (Olitsky & Cosgrove, 2016; Lopez-Perez, Lopez-Perez, & Rodriguez-Ariza, 2011). Online components of blended learning provide flexibility to complete coursework at the student's convenience. By reduced classroom contact hours and the online delivery of study materials, assessment and coaching, blended learning makes academic education attainable and convenient for students who have other commitments that are time-and place-bound (such as work, family care, disabilities, or living in a remote location) (Deschacht, & Goeman, 2015; Shea, 2007; Vaughan, 2007). Furthermore, because less classroom time is required, blending has the potential to reduce operating costs for universities (Olitsky & Cosgrove, 2016; Twigg, 2003).

Blended learning became the focus of many research studies, some of which compared blended and face-to-face learning (Drysdale et al, 2013; Halverson et al., 2014). These studies enable us to draw conclusions about the effectiveness of blended learning compared to more traditional education. It is widely accepted that blended learning holds the potential to make higher education more attractive, accessible and effective for learners. However, as it is reported in several studies which mainly focus on meta-analysis (Deschacht & Goeman, 2015; Wanner & Palmer, 2015; Spanjers et al, 2015; Bernard et al, 2014; Schmid et al., 2014; Means et al, 2013; Tamim, et al., 2011; Sitzmann et al, 2006) research findings on the effects of blended learning show mixed results.

In the meta-analysis they conduct, Spanjer et al (2015) revealed that, "on average, blended learning is somewhat more effective than traditional learning. Additionally, students evaluated it as equally attractive, but seemed to perceive it as more demanding. However, the effects on effectiveness, attractiveness and perceived demands differed much between studies" (p. 59). Some of the studies in the literature report positive results in terms of greater student engagement, more flexibility for accommodating different learning styles, and improved student outcomes and student perceptions (Shea & Bidjerano, 2014; Lopez-Perez, Perez-Lopez, & Rodríguez-Ariza, 2011; *Faculty Focus*, 2014; Jones & Chen, 2008) while others report some of the challenges and negative effects on aspects such as performance, student retention, student reactions, student expectations of less work and students' lack of self-responsibility for their learning. The increased time commitment and the lack of institutional and technical support are among the major issues reported by instructors (Xu & Jaggars, 2011; Levy, 2007; Sitzmann et al, 2007; Xenos, Pierrakeas, & Pintelas, 2002).

4.2. Flipped Learning

By Serap Kurbanoglu

The flipped classroom is a blended learning approach which integrates face-to-face and online delivery methods (Partridge, Ponting, & McCay, 2011). It retains the advantages of blended learning such as optimizing in-class interaction between students and the instructor, and the flexibility and variety of the online lecture content (Becker, 2013; Lopez-Perez, Perez-Lopez, & Rodríguez-Ariza, 2011). It is a fundamental redesign that transforms the structure of teaching and learning where a student is first exposed to new material outside of class, usually in the form of a video presentation available online; then the class time is used to apply the knowledge acquired from instruction material in the form of problem-solving and discussion. Flipped learning provides flexible environments where students can choose when, where, what and how to study and learn (Wanner & Palmer, 2015). The flip is causing a shift in the responsibilities and roles of both the instructor and the student. While the instructor acts as a facilitator, assisting students where needed and offering additional clarification as required (Obradovich, Canuel & Duffy, 2015) students become active learners who take on the responsibility of learning.

The flipped classroom refers to a teaching method (a pedagogical model), that delivers the lecture content (interactive videos or tutorials) to students before the class for them to study on their own time and uses class time for practical application activities where students review and apply what they have previously learned (Obradovich, Canuel, & Duffy, 2015; Arnold-Garza, 2014; Sophia & Flipped Learning Network, 2014; Benjes-Small & Tucker, *2013*, *Fawley, 2013;* Walvoord & Anderson, 2011*)*. The objective of the flipped classroom is to engage students in active learning by having them apply core concepts to a variety of contexts in order to more effectively build concepts into their knowledge base (Obradovich, Canuel, & Duffy, 2015). In other words, the flipped classroom reverses the traditional educational model by delivering the lecture outside of class, and spending class time on practical application assignments, formerly called homework (Albert & Beatty, 2014; Vaughan, 2014; Benjes-Small & Tucker, *2013;* Fawley, *2013;* Bergmann & Sams, 2012; Educause, 2012). Under this approach, before attending class, students become

familiar with the material and achieve knowledge and some comprehension, which are classified at the low levels of Bloom's Taxonomy (Anderson, Sosniak & Bloom, 1994). This allows class time to focus on the more difficult tasks of applying, analyzing, synthesizing, and evaluating, which are considered higher levels of learning (Olitsky & Cosgrove, 2016).

The flipped classroom, also known as "inverting the classroom" (Lage, Platt & Treglia, 2000), and sometimes "peer instruction" (Crouch & Mazur, 2001), is becoming more prevalent. It is not unusual to see it referred to simply as "the flip". The flip evolved out of experimentation with blended learning and problem based learning, along with the utilization of active learning techniques and new technologies for enhanced learning opportunities to students (Arnold-Garza, 2014). It combines synchronous and asynchronous learning. Most descriptions of the flipped classroom suggest that multimedia lectures be recorded so students can view them out of class and at their own pace (homework). The asynchronous approach of recording lectures for students to view out of class at their own pace frees up in-class time for student centered synchronous learning (O'Flaherty & Phillips, 2015). Focus is on "just-in-time" instruction (Fawley, 2013). The lecture content is provided mainly through electronic means such as videos, podcasts or online tutorials which may incorporate animations, screen captures, and other multimedia content (Arnold-Garza, 2014). Students are instructed to view the lecture content outside of class. Class time is used by instructors, generally based on active learning and group work, to guide students and to create a collaborative and engaging learning environment (Wilcox-Brooks, 2014).

The flipped classroom first emerged from and was popularized in secondary education in early 2000s. The idea is most often attributed to Jonathan Bergmann and Aaron Sams, two high school chemistry teachers from Colorado, USA, who started videorecording their lectures in 2006, to provide instruction to their students so as to free up more time for practical work in the lab (O'Flaherty & Phillips, 2015; Benjes-Small & Tucker, *2013;* Arnold-Garza, 2014*).* Following K-12 practices, the flipped classroom movement extended to the higher education level, and faculty across disciplines have started to experiment with it (Wilcox Brooks, 2014; Albert & Beatty, 2014; Gilboy, Heinerichs & Pazzaglia, 2015; Schlairet, Green & Benton, 2014; Enfield, 2013; Strayer, 2012; Twigg, 2003; Lage, Platt, & Treglia, 2000)

Although it has gained popularity and attention especially during the last decades, instructors have been experimenting with the flipped classroom for a longer period in different forms. It could be argued that it has been in existence for a number of years, through the requirement of students having to complete preparatory work before attending class to discuss concepts at a deeper level (Strayer, 2012). Especially in higher education, it has been and still is quite common to ask students complete assigned readings (nowadays also videos) and devote class time to discussions (Wilcox Brooks, 2014). Well-known online resources providing access to recorded lectures and instructional videos such as Khan Academy, Coursera and TED talks are also often used for this purpose and therefore associated with the flipped classroom (Arnold-Garza, 2014*).* Instructors implementing the flip sometimes use these resources to support the lecture content (Bull, Ferster, & Kjellstrom, 2012). This could be particularly enriching when an outside perspective is needed (Arnold-Garza, 2014*).*

The flipped classroom is no longer a new concept and is increasingly becoming popular as more instructors (teachers, professors and librarians) are testing this new learning strategy and creating new ways to improve current methods. The literature review which indicates its effectiveness at improving student achievement (Olitsky & Cosgrove, 2016; Wilson, 2014; Mason, Shuman, & Cook, 2013; Deslauriers, Schelew & Wieman, 2011) also proves that it is still a challenging movement (Wilcox Brooks, 2014; Buemi, 2014; Kolowich, 2013; Mangan, 2013). In their current literature review O'Flaherty & Philips (2015) indicate that there is limited published empirical validation on student learning outcomes from the flipped learning approach. Although there are some studies which compared student performance in a flipped classroom to the traditional lecture (Albert & Beatty, 2014; Fulton, 2012; Garver & Roberts, 2013), only very few studies demonstrated robust evidence to support that the flipped learning approach is more effective than

conventional teaching methods. Other researchers also point out a need for stronger evidence. (Bishop & Verlager, 2013). On the other hand, it is evident that there is a strong willingness for instructors to engage in the redesign of their students' learning experiences using the flipped classroom (O'Flaherty & Phillips, 2015). Studies focusing on student perceptions of the flipped class are generally positive with a significant minority having some negative (as in Strayer, 2012) views. This suggests that the flipped classroom may not be applicable to all subjects.

One of the frequently cited limitations of the flipped classroom is the lack of rigorous research measuring the impact of this model on student learning (Obradovich, Canuel, & Duffy, 2015; Arnold-Garza, 2014; Enfield, 2013; Gilboy, Heinerichs & Pazzaglia, 2015; Lemmer, 2013). Much of the assessment of the flipped classroom model is focused on students' perceptions. Although it provides valuable information, further assessment is needed on its impact on student achievement. Very few used a pretest-posttest design for assessment of learning (Rivera, 2015).

The flipped classroom moves away from a teacher-centered to a more collaborative, student-centered learning environment by reversing the traditional model of a classroom, and focusing class time on student understanding rather than on lecture (Acedo, 2013). However, to be successful, it requires effort both on the instructors' and the students' behalf. It is especially useful if students are motivated to do independent work and enjoy more collaborative in-class sessions. This method might not be appropriate for every individual, every class, every lesson or every subject (Patriquin, 2015).

Many authors examined the benefits of this pedagogical model over the traditional model (Obradovich, Canuel, & Duffy, 2015; Albert & Beatty, 2014; Berrett, 2012; Garver & Roberts, 2013; Mok, 2014; Rivera, 2015). There are numerous potential positive as well as negative aspects to this style of learning (Acedo, 2013) to be taken into consideration before it is implemented. On the one hand, critics agree that the changeover to the flipped model encourages teachers to re-evaluate their teaching and instructional material (Hamdan et al., 2013). On the other hand, success depends entirely on how it is implemented and on the skills of the teacher who implements it.

Benefits of the Flipped Classroom

The flipped learning approach is significant as it has the potential to equip learners with 21st century skills (O'Flaherty & Phillips, 2015). A flipped classroom has many strengths, each of which "has implications for student learning and may be more strongly or weakly demonstrated depending on the specific implementation" (Arnold-Garza, 2014, p.8*). According to its* proponents this pedagogical model is beneficial for a number of reasons (O'Flaherty & Phillips, 2015).

Supports diversity in students' learning pace: With access to lecture content prior to class meeting, students can take as long as necessary to master the material. Since people learn at a different pace, they can pause, rewind, rehear or re-take a tutorial if they need to do so, and move on to the next concept only when they are ready **(***Edudemic's Guide to Flipped Classrooms*, 2015; Schlairet, Green & Benton, 2014; Youngkin, 2014; Arnold-Garza, 2014*;* Enfield, 2013; Sams & Bergmann, 2013; Benjes-Small & Tucker, *2013***)**. This allows students who need more time to understand certain concepts to take their time reviewing the material (Acedo, 2013) and helps to keep more of the students on the same page, leaving only fewer behind (Patriquin, 2015). Giving the freedom to learn at their own pace provides students more control over their own learning in flipped classroom (O'Flaherty & Phillips, 2015).

Provides efficient use of class time and just-in-time, point-of-need assistance: Today, instructors are under pressure to meet increased curriculum requirements in a shorter period of time (Berrett, 2012; Enfield, 2013; Roehl, Reddy & Shannon, 2013). This forces them to make more efficient use of class time. In the

flipped classroom, students can get the most out of class time by spending it on practical applications, discussions, questions and answers, learning by doing, and learning from peers, instead of inactive lecture (O'Flaherty & Phillips, 2015; Cole, & Kritzer, 2009). Class time devoted to application gives instructors the chance to guide and help the students who struggle **(**Benjes-Small & Tucker, *2013) and* gives more time in the classroom to interact and clarify material as well as to explore unclear concepts. It allows instructors to provide point-of-need assistance to students as they complete in-class exercises (Arnold-Garza, 2014). Providing students with feedback as they apply new skills is one of the most important benefits of the flipped classroom model (Obradovich, Canuel, & Duffy, 2015; Enfield, 2013). In the flipped approach, classroom time can be used for additional learning objectives, application of new learning and assessment tasks, robust discussion and associated problem solving activities as well as focusing on the development of higher cognitive skills (Patriquin, 2015; O'Flaherty & Phillips, 2015). It helps instructors to optimize the limited time they have with students (Arnold-Garza, 2014; Enfield, 2013; Roehl, Reddy, & Shannon, 2013; Berrett, 2012).

Provides more active learning opportunities for students: In the flip, instructors are in an advisor role in the classroom and students are no longer passive participants. Instead of passively listening to a traditional lecture, students participate in activities such as group discussions, problem-based learning, case studies, or conceptual exercises during class time (Gilboy, Heinerichs & Pazzaglia, 2015; Obradovich, Canuel, & Duffy, 2015). Students are encouraged to study independently or in groups with their peers (Patriquin, 2015). Obviously learning by doing is not a unique principal to the flipped classroom model. Instructors have used the active learning strategy and incorporating active learning exercises for a long time. What differs in the flip approach is that it provides more time for active learning to happen in the classroom, and incorporates active learning as a core component of teaching, rather than supplemental to a lecture (Gannod, Burge & Helmick, 2008).

Promotes development of higher order thinking skills: By allowing students to apply their knowledge within a variety of contexts, the flipped classroom model motivates students to achieve higher-order thinking skills in Bloom's Taxonomy of learning (Gilboy, Heinerichs, & Pazzaglia, 2015; Murray, Koziniec, & McGill, 2015; Rivera, 2015; Obradovich, Canuel, & Duffy, 2015; Schlairet, Green & Benton, 2014; Albert & Beatty, 2014; Becker, 2013; Enfield, 2013; Sams & Bergmann, 2013; Semple, 2013; Strayer, 2012). With basic course content shifted outside the classroom, in the flip model, students can use active learning strategies to develop their knowledge application, analysis, and synthesis skills (Gilboy, Heinerichs & Pazzaglia, 2015; Sams & Bergmann, 2013).

Promotes better student-instructor one-on-one interaction: The flipped classroom provides better student-instructor interaction through active learning during class time (Fawley, 2013). As mentioned earlier, there is more time for classroom discussions and exercises. Students can talk with instructors one-on-one about what they are struggling with and instructors can have a better opportunity to detect errors in thinking or concept application and provide individualized help (*Edudemic's Guide to Flipped Classrooms,* 2015; O'Flaherty & Phillips, 2015; Acedo, 2013; Prober & Khan, 2013; Kellogg, 2009). Instructors can address questions and problems as students encounter them and check in with individuals (one-on-one interaction) and/or groups around the classroom as students work (Enfield, 2013; Lage, Platt, & Treglia, 2000). However, this benefit would not extend to the large classes without additional teaching assistants (Lage, Platt, & Treglia, 2000).

Increases student responsibility for learning: The flipped classroom places the responsibility for learning mainly on the shoulders of the students (O'Flaherty & Phillips, 2015; Overmyer, 2012). *T*he flip is the change in emphasis from instructor responsibility for student learning to increased student responsibility (Educause, 2012). This model provides students the power to control, in other words assume the ownership, of their own learning (Patriquin, 2015). They review lecture content before the class and during the class they engage with a variety of activities. Instructors are there to support, not to lecture or present **(**Benjes-

Small & Tucker, *2013). Although* students have an ultimate responsibility for their learning (Gallagher, 2007), the amount of control given to students may vary by circumstance (Arnold-Garza, 2014).

Addresses multiple learning styles: Learning differences are addressed in two ways: firstly, outside classroom, through variety of instructional material in different formats which embraces learning style diversity; secondly, in the classroom by reflecting on the lecture material through questions and discussions. Students can fill in their knowledge gaps through discussions, working in groups with their peers, by demonstrating or arguing for their own solutions, by checking their understandings through in class experimentation, and by peer tutoring (Gallagher, 2007; Gannod, Burge & Helmick, 2008).

Provides Improvement on lecture material: In the flip, lecture content is generally provided through electronic means, nowadays mainly through videos. To be able to make manageable length videos, instructors are forced either to break a topic into several parts (videos) addressing subtopics, which could help students access and process a large, interconnected set of ideas more easily, or emphasize the most important points by excluding extraneous information (Arnold-Garza, 2014*). In both cases lecture notes are improved.*

Mitigates inequity caused by the involvement and education level of parents: This is generally mentioned for K-12 level of education. Students might have different levels of help or no help from parents for completing homework. Parents may not have the time or knowledge to be a support for their child. In the flip model, all students have a chance to get face-to-face help directly from their instructor as they tackle their assignments in the classroom (Ash, 2012).

Promotes better student engagement and confidence through student-centered learning and collaboration: The flipped classroom allows class time to be used to master skills through collaborative projects and discussions. This encourages students to teach and learn from each other with the guidance of their instructors. Allowing students to take responsibility for their own learning helps them build confidence (Acedo, 2013). Being able to ask questions of their instructors in a one-on-one setting or of the peers in the same small group potentially can make shy students more comfortable in the classroom setting. Group collaboration also prepares students for the real world, where teamwork is crucial (*Edudemic's Guide to Flipped Classrooms,* 2015).

Provides easy access to the lesson content: When they are made available online, video lectures and tutorials can be accessed 24/7. Thus, students who miss class for one reason or another, can catch up quickly (Albert & Beatty, 2014; Becker, 2013; Enfield, 2013). This also gives instructors more flexibility when they miss a class (Acedo, 2013). It allows parents to access lecture content if they would like to do so and be better prepared when attempting to help their children. It also provides parents with insight into the quality of instruction their children are receiving (Acedo, 2013). This last point mainly is a concern in K-12 education.

Challenges of the Flipped Classroom

Despite its rapid growth, popularity, and numerous advantages, as with any pedagogical approach, there are challenges involved with the implementation of a flipped classroom. Following are some of the concerns that often are expressed in the literature.

Reliance on student preparation, participation, cooperation and motivation: The flip relies heavily on student preparation and participation. One must trust students to watch the lecture videos at home. However, there is no way to guarantee students will cooperate. The flipped model only works if students are motivated to learn and cooperate (Acedo, 2013). If students do not watch the videos before the class, they will be

unprepared to apply their new knowledge during the class. As O'Flaherty & Phillips (2015) indicate that lack of engagement with the pre-class activities results in variability of student preparedness. Similarly, if students sit back in the class and do not take part in group discussions and collaborative work, it will be a challenge for the active learning approach (*Edudemic's Guide to Flipped Classrooms*, 2015; Benjes-Small & Tucker, *2013).* Interactive pre-class activities like short quizzes completed before class can help ensuring that the lecture material is viewed at home (Arnold-Garza, 2014). There also needs to be a balance between pre-class preparatory activities and time spent with actual face-to-face work (O'Flaherty & Phillips, 2015).

Significant work and time investment on the front-end: Implementing a flipped classroom requires additional time and effort and adds extra responsibilities for instructors such as creating more instructional material, including videos, preparing appropriate classroom activities, exercises and assignments that will enhance the subject matter, as well as motivating students to complete these exercises and participate in classroom activities and engaging the whole class (Acedo, 2013). The flip model requires, in a way, redesigning the curriculum in order to integrate pre-class activities better into the face-to-face classes (O'Flaherty & Phillips, 2015; Tucker, 2012). Creating the instructional materials for a flipped class can be time-consuming due to the process of filming, editing, making videos available online, and updating them continuously. Additionally, effort required to develop interactive materials could pose some obstacles in terms of resource allocation and lack of IT support. The flipped model requires funding for the creation of materials along with ongoing maintenance (O'Flaherty & Phillips, 2015). The more complex or sophisticated the lecture tools and learning objects are, the more time is required of instructors to implement the flipped classroom (Michel, Hurst, & Revelle, 2009; Gannod, Burge & Helmick, 2008; Lage, Plat & Treglia, 2000). In the flip, instructors need to be highly organized and plan well ahead of class. But the time and effort invested in creating materials for the flipped classroom will be reduced after the first implementation, because they can be updated and adapted more easily in subsequent years (Patriquin, 2015).

Might require new skills for instructors: One of the obstacles is related to instructors' capacity to design, implement and evaluate the effectiveness of their flipped classrooms (O'Flaherty & Phillips, 2015). This includes pedagogical adequacy as well as technical proficiency. On one hand, instructors may need to learn new technology skills not only to create video lectures (filming and editing) (Educause, 2012), but also to create and synchronize captions for videos or tutorials when necessary for individuals with disabilities, in order to provide equal access. Instructors must be comfortable using different forms of technology and be willing to learn new skills (Patriquin, 2015). On the other hand, instructors might lack pedagogical understanding and need support to develop skills needed to effectively translate the flipped classroom concept into practice (O'Flaherty & Phillips, 2015; Hamdan et al., 2013).

Lack of immediate help on lecture content: As Bergman notes "by reviewing lecture content at home, students cannot get immediate answers to their questions as often happens in the traditional classroom" (as cited in Arnold-Garza, 2014, p.17). However, this disadvantage can be overcome by the use of online discussion boards and blog posts. Journaling can also help students record their questions (Arnold-Garza, 2014).

Lack of time management skills: Although generally referred to as an advantage, the self-paced nature of the flipped model might sometimes become a disadvantage for some students. Additionally, it becomes problematic if the pre-class preparation requires knowledge and skills that students do not yet possess (Hamdan et al., 2013). Although students generally like to work at their own learning pace (quickly or more slowly) they might not be capable of managing their time and work (Ash, 2012). The flip is certainly a big cultural shift and the educational system might not be ready to embrace self-paced learning yet (Nielsen, 2012). However due to relatively better developed self-management skills of college and university students, it is easier to embrace this model in higher education (Arnold-Garza, 2014).

Lack of access to appropriate technology: In the flip model it is necessary for students to have access to a computer and a high speed Internet connection, in order to view the lecture material. In other words, online access poses a barrier to students without computers and connectivity at home (Patriquin, 2015; Acedo, 2013; Hamdan et al., 2013). Although both technologies (computers and connectivity) are widely available in many households today, this might not be the case for students from low-income districts (Acedo, 2013). Although providing lecture content on DVDs and use of library facilities are recommended as alternative solutions, it becomes impractical if there is no library nearby and if the resources (computers and connectivity) of the library are also limited (*Edudemic's Guide to Flipped Classrooms*, 2015). This barrier is also less of a concern in a higher education context where computers are available for on-campus use, 24/7, I some cases. However, if flipped model is widely used in a campus, resources to support this model might easily become inadequate (Arnold-Garza, 2014).

Students' adaptation problem and resistance: Student resistance to such a drastic change in the classroom setting is also a frequently mentioned drawback to the flipped classroom (Obradovich, Canuel, & Duffy, 2015; Gilboy, Heinerichs & Pazzaglia, 2015; Sankey & Hunt, 2014; Garver & Roberts, 2013; Strayer, 2012). Students might be unfamiliar with the flipped model; they might have difficulty understanding what is expected from them. Furthermore, they might lack genuine interest in the material and can be frustrated by demands for their time and attention (Strayer, 2012; Arnold-Garza, 2014; *Edudemic's Guide to Flipped Classrooms*, 2015). Some students might simply prefer the traditional face-to-face lecture type classroom format (Patriquin, 2015). Students may respond with confusion or discomfort when they are required to adjust to the model. Therefore, especially due to the increased responsibility for students, instructors must clearly communicate the reasoning behind implementing the flipped classroom model to obtain student support and they must provide clear explanations about their expectations (Arnold-Garza, 2014). This might include telling students what they must be able to do by the end of a unit, providing multiple ways of engaging with the content, allowing for demonstration of learning through a variety of channels, and being fully available to students as they work through the process (Garver & Roberts, 2013; Bergmann & Sams, 2012). They should also ensure that the content covered in the online videos matches the in-class activities to help students orient themselves to these activities (Obradovich, Canuel, & Duffy, 2015; Herreid & Schiller, 2013; Strayer, 2012).

Time in front of screens is increased: There are some arguments that if the flip model is widely adapted (used in most classrooms and lectures) students will end up spending hours in front of a computer watching the lectures (Acedo, 2013). One can also easily argue in return, that this is the way Millenials live. However it should be considered that learning through a computer might not well suit every subject and every individual.

Inequities in instructors' attention: There may not be enough time to help all of the students at one time. While the instructor works one-on-one with one student or group, other students or groups might be struggling or need an equal amount of help. In other words, the rest of the class might not stay on task while an instructor focuses on one person or group. This problem can be overcome by providing help from teaching assistants (*Edudemic's Guide to Flipped Classrooms,* 2015).

In conclusion, before adopting the flip model, instructors should take all of its pros and cons into consideration and make sure that it supports the pedagogical goals of the curriculum.

4.3. Gamification

By Christian Schlögl

Gamification is another approach to facilitate learning. It is based on the assumption that people like to play games since they usually are fun and engaging. Before discussing the concept of gamification, we will explore the basic meaning and identify the elements of a game.

According to Kapp (2012, p.7), a "game is a system in which players engage in an abstract challenge, defined by rules, interactivity, and feedback, that results in a quantifiable outcome often eliciting an emotional reaction." From this definition, the following basic elements of a game can be derived (Kapp, 2012, p.7):

- System: A game can be seen as a system in which the various components are linked with each other. For instance, scores are linked to actions, and actions are limited by rules.
- Players: They interact with the play content and/or with other players. In a learning context, they are the learners.
- Abstraction: Game space is usually an abstraction of reality though it contains elements or even the essence of a realistic situation.
- Rules: The rules define, for instance, the winning state or the allowed activities, and thus give the game a structure.
- Interactivity and feedback: Players interact with the game content and with each other. Usually, each activity of a player results in an instant, direct and clear feedback which can be positive or negative.
- Challenge: An essential feature of games is that they challenge the players to achieve certain goals and outcomes.
- Quantifiable outcome: The winning state of a game is clearly defined.
- Emotional reaction: Contrary to most human interactions, games evoke strong emotions on many levels.

According to a simple and often found definition gamification is the application of game elements to non-game activities (e.g., Nah, et al. 2014). More refined is the definition by Kapp (2012, p.10) according to which "gamification is using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems." Core elements of this definition are (Kapp, 2012, p.11):

- game thinking
- game-based mechanics
- aesthetics and
- engagement and motivation of action.

Game thinking is definitely the most important aspect of gamification. The idea behind is that everyday experiences are converted into activities which comprise elements like competition, cooperation, exploration and/or storytelling. Game-based thinking can be realized using so-called game-based mechanics, which include elements like point systems, levels, badges and time constraints. The user interface, in particular the graphical design (aesthetics), is very important for gamification to be successful. Finally, the explicit goal of gamification is to gain a person's attention and to drive participation in an activity.

Table 1 shows in which features gamification typically differs from other game-based approaches. As can be seen, a Play, which is the simplest form, is characterized by its spontaneity. In contrast, a Game has rules, a structure and clear goals. While Games are usually for fun, Serious Games take place in real-world situations, for instance, in economics, politics, health or military. Gamification usually intents do reach an

outcome in real world by applying game elements to non-game activities and integrating them in real world contexts.

Table 1. Differences between game-based approaches (on the basis of Wikipedia 2018)

	Play	**Game**	**Serious Game**	**Gamification**
Spontaneity	Yes	No	No	No
Rules	No	Yes	Yes	Yes
Goals	No	Yes	Yes	Yes
Structure	No	Yes	Yes	Yes
Outcome in real world	No	No	Yes/no	Yes
System integration	No	No	No	Yes

In a review of literature comprising 15 publications on gamification in educational and learning contexts, Nah et al (2014, p. 405) identified the following design elements frequently used:

- Points: They measure the achievement and can be used in different contexts (e.g., as rewards, as an investment for further progression, or to indicate a player's standing).
- Leaderboards: A leaderboard is used to create a competitive environment. Usually, only the top scores (e.g., the top 10) are shown in order to avoid demotivation for those who are lower ranked.
- Badges: They show to what extent tasks were accomplished during the process of goal achievement. They are used to maintain learners' motivations in subsequent learning tasks.
- Progress bars: While badges show the achievement towards a particular goal, progress bars are used to give feedback about the overall goal progression. They can either be used to motivate people who are close to achieving their goal or to encourage them if they are falling behind their goals.
- Prices and rewards: The use of prices and rewards can also be effective in motivating players. Usually, it is better to give multiple small rewards than one big reward. Furthermore, they should be evenly distributed throughout the game/ learning process.
- Levels/stages (for instance, initial vs. advanced level): They are often applied to give players a sense of progression in the game.
- Story telling: Many games have a story narrative behind them which provides relevance and meaning for the application of tasks. This is in particular true for video games (Kapp, 2012, p.41).
- Feedback: The frequency, intensity and immediacy of feedback has a strong impact on a player's engagement. Usually, frequent and immediate feedback increases users' engagement.

In another review Hamari, Koivisto and Sarsa (2014) examined 24 empirical studies on gamification. Besides the eight game elements identified in the study by Nah et al (2014), they also considered "clear goals" and "challenge" as an own motivational affordance category. As their results show, leaderboards, points and badges were most frequently used in the studies. These three game mechanisms were also found the most applied ones in the study by Dicheva et al (2015, p.80 f.) who analyzed the empirical research on the application of gamification to education (34 publications were investigated). Blended learning courses were the most used type of gamification application (in more than half of all cases). Concerning the subject, by far most topics were related to computer science/IT.

Scientometric Analysis of the Literature on Gamification

In a simple scientometric analysis of Web of Science publications, the development of research in recent years and the main disciplines dealing with gamification should be identified. In particular, it should be examined to which extent gamification is covered in library and information science literature. Only publications were considered which included "gamification" in the title. Due to their relevance for research, only the document types article, review and proceedings paper were taken into account. Data was collected

in April 5th 2018. In total, 928 research papers (62.4 % proceedings papers, 36.5 % articles, and 2.1 % reviews) were retrieved.

As can be seen in Figure 1, gamification is a research topic which evolved in recent years. Since not all publications might have been entered for the publication year 2017 in Web of Science databases, it is most likely that the number of publications for this year will be higher in future analyses.

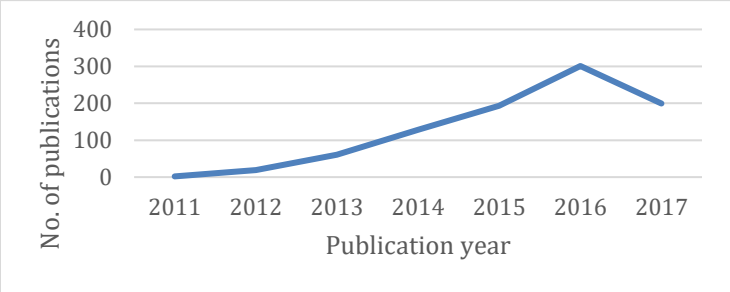

Figure 1: Research publications on gamification in WoS (n=928)

Table 2: Research publications on gamification in various disciplines

Rank	Research Area	No. of publications
1	Computer Science	389
2	Education & Educational Research	297
3	Engineering	167
4	Business & Economics	69
5	Telecommunications	44
6	Psychology	36
7	Social Sciences, Other Topics	36
8	Information Science and Library Science	27
9	Communication	25
10	Health Care Sciences & Services	20

By far the most gamification publications accrue to Computer Science (41.9 %) and Education and Educational Research (32 %) (see Table 2). Only 27 publications (2.9 %) were assigned to Library Science and Information Science. A closer look shows that only less than half of these publications are from Information Science when not considering the publications from neighboring disciplines like Information Systems or Social Informatics. It follows that not much research has yet been performed on gamification in library and information science.

Gamification - Pros and Cons

Both the meta analyses by Dicheva at al (2015) and by Hamari, Koivisto and Sarsa (2014) conclude that the majority of the reviewed studies report about positive effects and benefits from gamification. However, in Hamari, Koivisto and Sarsa's analysis, most reviewed papers showed also some negative tendencies on motivational affordances. Only in two studies, all results were positive.

Dicheva et al (2015, p. 83) summarize the following aspects from the papers which reported positive results: "… significantly higher engagement of students in forums, projects, and other learning activities …; increased attendance, participation, and material downloads …; positive effect on the quantity of students'

contributions/answers without a corresponding reduction in their quality …; increased percentage of passing students and participation in voluntary activities and challenging assignments …; minimizing the gap between the lowest and the top graders".

The studies with mixed results came to the following conclusions: "… missed critical motivational elements in the application of gamification …, sensitivity of the outcomes to small changes in the implementation, a requirement for an ongoing monetary and time investment …, and the need of strong teaching staff able to design effective assignments, grade students' work relatively quickly, and interact with students closely" (Dicheva et al, 2015, p. 3).

According to Hamari, Koivisto and Sarsa (2014, p.3038), some studies showed that the results from gamification may not be long-term but could be due to a novelty effect. Several other studies (Barata et al, 2013; de-Marcos, Dominguez & Saenz-de-Navarrete, 2014; Dominguez et al, 2013; Ibanez, Di-Serio & Delgado-Kloos, 2014) report that the positive effects on engagement are (often) stronger than on learning outcomes. Muntean (2011, p.325) mentions the danger that students could fall into a behavior where they only learn when provided by an extrinsic motivation.

4.5. MOOCs

By Àngel Borrego

In the past few decades, technology has brought enormous changes to how higher education is delivered. In the first place, distance education allowed students to learn without physically attending training activities, but using materials delivered to their homes. At a later stage, following suit of the principles of the free software movement, open education has claimed for the adaptation, sharing, remixing and collaboration in the elaboration of teaching and learning materials (Chiappe-Laverde, Hine & Martínez-Silva, 2015). Most initiatives in this field have promoted the creation of Open Educational Resources (OER).

Massive Open Online Courses (MOOCs) are online courses with unlimited enrolment in terms of number of students delivered through the Internet. Gore (2014) denotes MOOCs as being: massive ―registration is not limited, with thousands of students enrolled, although some MOOCs have pre-requisites and for-fee registrations, examinations or certificates of completion―; open ―taking advantage of widely available OER―; online ―without requirements for face-to-face attendance―; and course ―the concept of a pedagogically designed learning journey―. In short, MOOCs share five features that characterize them: free access, adaptation, remixing, sharing and collaboration.

MOOCs are a relatively recent development in higher education. They were first introduced in 2006 and immediately became very popular until the *New York Times* declared 2012 "the year of the MOOC" (Pappano, 2012). This popularisation resulted when several providers, associated with top universities, started offering platforms such as Coursera (https://www.coursera.org), Udacity (https://www.udacity.com) or edX (https://www.edx.org). One of the distinguishing features of MOOCs is that they make available top-ranked universities training to people who would not have access to courses delivered by these universities otherwise. Content is offered online to any person who wants to follow the course with no cost and without requirements of attendance.

Two types of MOOCs are usually distinguished (Bartolomé & Steffens, 2015). On the one hand, cMOOCs rely on Stephen Downes and George Siemens' ideas of connectivism and the concept that learning focuses on connecting information sets. These connections that enable students to learn more are more important

than their initial state of knowledge. In addition to traditional course materials such as filmed lectures, readings, and problem sets, this kind of MOOCs also provide forums to support community interactions among students and teaching staff. On the other hand, xMOOCs, developed by institutions such as Stanford and MIT, are based largely on traditional methods of distance education.

Possibly, the major concern related to MOOCs refer to the low completion rates. Even though the number of students enrolled is usually in the thousands, the drop out tends to be very high, with a very small portion of the students completing the course, usually well below 10%. Other concerns have arisen regarding the financial viability and sustainability of MOOCs since large financial investments are being made producing little economic revenue. Additionally, possible low quality compared to traditional courses and certification are other issues of concern (Chiape-Laverde, Hine & Martínez-Silva, 2015).

Robinson and Bawden (2018) have identified a set of issues that affect student recruitment and retention in MOOCs, including student background and motivation, the extent to which MOOCs can be tailored to students' needs and whether MOOCs can be integrated into other types of learning. Pedagogical design is another important issue that has been frequently overlooked. Many universities have debated the effects of MOOCs on their current practices but little consideration has been paid to the pedagogical issues involved in the design of a MOOC.

MOOCs in LIS

Despite Robinson and Bawden (2018) state that there are very few examples of LIS involvement in MOOCs development, several authors have compiled lists of MOOCs delivered in the field of Library and Information Science (LIS) (Pujar & Bansode, 2014; Sawant, 2017).

In a similar fashion to what has happened in other fields, a period of large and quick increase in the number of MOOCs available during the first part of the 2010s has been followed by a decline in the amount of courses offered. Below there is a selection of MOOCs offered in the discipline. Although most of them are not currently available for enrolment, most of their contents can be freely consulted, allowing users to follow the course on a self-paced basis.

New Librarianship Master Class
https://davidlankes.org/new-librarianship/new-librarianship-master-class-mooc/
The New Librarianship Master Class was set up as a MOOC in 2013 by R. David Lankes. Lankes is the Director of the University of South Carolina's School of Library and Information Science and recipient of the American Library Association's 2016 Ken Haycock Award for Promoting Librarianship. All course content is currently available at the website, organised in four weeks, but there are no live discussion boards or tests.

Hyperlinked Library
San José State University – School of Information
https://ischool.sjsu.edu/programs/moocs/hyperlinked-library-mooc
The course started in 2013 and was offered by the School of Information at San José State University. It provides "a roadmap toward becoming a participatory, interactive, user-centered library". Unfortunately, the contents of the course are no longer available, but a video is available online exploring the experiences and insights of LIS professionals who participated in the first edition of the course (https://youtu.be/Yt2kV72VS7Y).

The Emerging Future: Technology Issues and Trends
San José State University – School of Information

https://learn.canvas.net/courses/292
The course, divided in six weeks, brings focus to the planning skills that are needed, the issues that are involved, and the current trends in relation to the potential impact of technological innovations. Topics covered include connectivity, cybersecurity or big data.

Library Advocacy Unshushed: Values, evidence, action
University of Toronto
https://www.edx.org/course/library-advocacy-unshushed-values-university-torontox-la101x#.VIyWA9KsWSq
Delivered by the University of Toronto, this course is currently archived. Users can explore the course in a self-paced fashion, watching the videos and working with the materials. Contents of the course include topics such as values and transformative impacts of libraries and librarianship; research on current perceptions of libraries and librarians; role of relationships in advocacy; principles of influence and their impact on advocacy; strategic thinking and planning in advocacy; and effective communication: messages, messengers, and timing.

Copyright for Educators & Librarians
Duke University, Emory University, University of North Carolina at Chapel Hill
https://www.coursera.org/learn/copyright-for-education
The course is a professional development opportunity designed to provide a basic introduction to US copyright law and to empower teachers and librarians at all grade levels. Contents are organised in five weeks, including copyright law; framework for thinking about copyright; owning rights; specific exceptions for teachers and librarians; and understanding and using fair use.

Research Data Management and Sharing
The University of North Carolina at Chapel Hill
https://www.coursera.org/learn/data-management
The course provides learners with an introduction to research data management and sharing. After completing the course, learners as expected to understand the diversity of data and their management needs across the research data lifecycle, be able to identify the components of good data management plans, and be familiar with best practices for working with data including the organization, documentation, and storage and security of data. Learners will also understand the impetus and importance of archiving and sharing data as well as how to assess the trustworthiness of repositories. The course is organised in five weeks.

Academic Information Seeking
University of Copenhagen, Technical University of Denmark
https://www.coursera.org/learn/academicinfoseek
The courses introduce the basic elements of academic information seeking, exploring the search process from defining a strategy to evaluating and documenting search results. The course is aimed to make attendants proficient information seekers. Students are expected to learn how to carry out comprehensive literature searches based on research assignments and they are guided through the various information seeking steps from selecting relevant search strategies and techniques to evaluating search results, documenting the search process and citing sources. The course is organised in three weeks.

Other MOOCs Useful to LIS Students and Practitioners

Obviously, in addition to MOOCs specifically addressed to library professionals and students, there are available multiple related courses that can be of interest to them. For instance, Sewell (2014) proposed a "library degree" based on MOOCs that compiled courses putting together her own LIS degree from

available online courses. The selection was organized in six categories: library specific courses; management and leadership; marketing; teaching; technological skills; and job application skills.

In a similar fashion, Sawant (2017) has recently provided a selection of non-library oriented MOOCs that includes examples of courses on topics such as financial and accounting management; leadership; people management; communication skills; marketing; statistics; website design; or academic integrity.

In addition, MOOCs offer an excellent opportunity to provide training in other LIS-related areas, such as information literacy. Indeed, MOOCs have been considered a convenient and effective approach for delivering information literacy instruction and Huang, Li and Zhou (2016) have described how to promote an information literacy instruction module and transform it into a successful and well-established MOOC.

Robinson and Bawden (2018) have recently identified 21 MOOCs on information literacy targeted to different types of learners. According to them, training in this field should combine four approaches: didactic explanation —with videos as possible substitutes of face-to-face presentations—; active learning exercises; resource evaluation; and information creation, reflective writing and creation of resource lists. However, the authors state that the nature of MOOCs on information literacy is so varied, all having been developed for a particular context, need or available expertise that it is difficult to draw general conclusions of good practice.

Conclusions

MOOCs can bring multiple options to LIS students to learn in an independent way. As in other disciplines, MOOCs allow students to enrol in courses delivered by a large range of institutions, widening the students' learning experience irrespective of their geographical location. MOOCs are also an opportunity for continuing professional education, allowing practitioners to be current in their professional field and to learn about new developments. Indeed, the nature and diversity of MOOCs available allow the interested professional the opportunity to catch up on nearly any topic.

Enrolment in MOOCs is also a useful source of information on how MOOCs work for students and professionals. This is an interesting opportunity given that some LIS graduates will work in academic and university libraries where they will have to support this kind of courses. Having first-hand experience in following a MOOC will provide them with a better guidance to offer library services to MOOCs developers. Thus, according to Gore (2014), as MOOCs continue to evolve, the requirement for the services of the librarian are set to increase. Libraries can offer support through the promotion of MOOCs; the dissemination of knowledge to and awareness-raising amongst MOOC authors, as to the availability of OERs, information literacy and digital literacy skills materials; giving advice on intellectual property rights, licences, and accessibility; the negotiation of licences required for learners to access content as part of their learning experience; enhancing digital library offerings and their open access alternatives; or supporting academics, MOOC working teams and learners.

Participation in MOOCs can also be an opportunity for LIS schools in order to collaborate with other schools and departments in the field, especially when an individual school is unable to offer a certain course because of lack of resources (Pujar and Tadasad, 2016). Indeed, in addition to be delivered as MOOCs, the contents and activities produced can also be used in order to blend them with traditional courses, customizing courses for native students. In sum, MOOCs can bring an opportunity to improve LIS education. Given the small nature of most LIS schools and the diversity of skills required in the field, MOOCs provide the tools both to diversify the training offer to current students and to practitioners who want to become involved in continuing education opportunities.

5. Trends in LIS Education

By Thomas Mandl

The information profession is undergoing huge changes as societies are developing into Information societies. Industry and also the private life of people rely more and more on digitally available information. This trend in society is obviously driven by technology but also by the continuous growth of information available. The fact that the amount of information worldwide is still growing rapidly has often been acknowledged (Hilbert & Lopez, 2012). Big Data is just one of the current buzz words illustrating this development. Access to this ever growing amount of knowledge requires additional and new skills for LIS professionals. They are confronted with many challenges related to the growth of knowledge. Only a few of them can be mentioned here.

- Diversity of sources: Data gains importance compared to other digital sources and especially compared to physical collections. The diversity includes several other aspects which information professionals need to cope with: Among them are languages, quality and formats.
- Specialization of domains: Information management requires special domain knowledge also for information professionals. The continuing specialization of science poses new challenges for LIS education (e.g. Robati & Yusuf, 2016).
- Diversity of consumers of information: The internationalization of science and the business requires more international thinking when providing access to information. The demand to serve academically and socially heterogeneous groups is also increasing.
- Technology supported learning is a trend in society. There is potential for offering learning digital experiences online which can be more socially inclusive, more individualized, flexible and more specialized. The information manager has a dual role when it comes to e-learning. Professionals need to be able to learn about new developments and they need to be able to enable access to content for other learners.

There are many current virulent trends which can be observed in LIS education due to the developments sketched above. This section will focus on a few ones which seem to be of special relevance based on an informal and qualitative assessment of recent scientific literature in the area of LIS education. Some affect primarily the content of LIS education but often that also reflects on necessary changes to the didactics in LIS.

The trends discussed in the following are:

- more active role of the learner,
- integration of technological knowledge,
- addressing diversity,
- from objects to data curation.

The role of the learner is shifting from a passive observer to a more active participant and contributor (Roehl et al., 2013). This fact has already been stressed in the previous sections on Flipped Learning and the Active Learning Classroom. These developments reach beyond LIS and are relevant for many disciplines. The active integration of the learner has many advantages: It integrates problem base approaches which motivate students and which enhance their collaborative skills. It trains the ability for self-directed study as such, accepts the diversity of a student population.

This section briefly reviews some of the applications within LIS (e.g. Arnold- Garza, 2014). An evaluation of a flipped classroom approach in an LIS master program applied videos as learning material before class. It was observed that the flipped classroom was an effective teaching method. Then main benefits were seen in the exposure to a large variety of approaches for teaching, allowing an individual pace and facilitating

understanding of material for non-native speakers (Johnston & Karafotias, 2016). Another positive result was reported also for a MA level LIS course. The use of blogs as a tool for creating a blended learning space developed the collaborative skills of students (Agosto et al., 2013).

Even within traditional classrooms, group work can support the goal of involving students more actively in education. A study for a BA class in Ireland showed that group activities are perceived as positive by students and seem to develop in particular soft skills like teamwork abilities (O'Farrell & Bates, 2009).

The curricula of LIS have continuously integrated practical phases like internships as a survey paper shows (Ball, 2008). This has been analyzed for the curricula in the US where the percentage of these phases has grown (Huggins, 2017). Liu argues even for the inclusion of research elements based on the results of an interview study (Liu, 2017). In an international study, the perspective of employers for the internship period has been analyzed. The results show that the employeers welcome students and that the see the educational task as a natural part of their activities. In addition, there were no relevant differences between the countries studied (Pymm & Juznic, 2014).

The need for information professionals to deal more with technology has been noted for many years. Education on technologies requires the active application of systems by students and as such, goes along the discussion of the more active role discussed above. Within LIS programs, the need to include more ICT skills has been discussed intensively. Many have argued for integrating more technological skills (e.g. Mole et al., 2016). The need to integrate more ICT has also been noted for e.g. the specific situation in India (Ramasamy, 2017; Nedumaran & Ramesh, 2017) and in Asia overall (Miwa, 2006). The trend has also been observed for curricular in Africa where the aspect of multimedia technology received particular attention (Ocholla & Bothma, 2007).

One relevant line of argumentation is the demand in the professional information field. In a text mining analysis of some 1000 job ads in a relevant LIS mailing list, the most frequent terms behind *digital* were *data* and *systems*. This indicates that technological skills are required in the professional field (Maceli, 2018). There is also some controversy about the skill level required. Do librarians and information managers need to program or do they require skills in managing and evaluating information systems?

Also the conceptual design of spaces and systems is of great importance and some have even suggested the inclusion of topics such as design thinking into LIS degrees (Clarke & Bell, 2018). Some studies focus on the technologies which need to be taught in detail. An analysis by Singh and Mehra goes beyond the level of courses and analyzes competencies as they are taught in courses of 25 LIS schools. The comparison to job ads resulted in a list of five core courses that should be taught in any LIS program and which are often missing: E-Resource Management, Core Web tools, Public Access Computing, Advanced Hardware and Technology Policies (Singh & Mehra, 2013).

The discussion about the necessary level of education of LIS professionals in the area of ICT will continue. The diversification of ICT tools and standards requires a constant reassessment of decisions on teaching content. Curricula designers also need to consider to teach either concrete tools or overall ICT competences. A study of 25 ALA accredited programs revealed that many courses were added or deleted. The areas with most courses added in the two-year study period were: User Experience, Social Media and Data Analysis (Maceli, 2018, p. 167).

Data Curation is certainly another growing area in the LIS profession. Data curation supports the entire life cycle of research. Research information systems and research infrastructures have been developed and can enhance the productivity of researchers. They provide data as well as adequate tools for processing (Hey & Trefethen, 2005; Neuroth et al., 2009). For that, librarians need to focus also on data in various forms. There is a growing demand for re-use of data and for scientific communication beyond texts. New terms for

professionals dealing with these issues have been developed, e.g. Data Librarian, Data Services Specialist, and E-Science Librarian.

The Association of Research Libraries has defined five core areas for activities for supporting E-Science (ARL 2006):

- Data management along the information life cycle, including collection, organization, description, curation, archiving, and dissemination.
- Creation of new data- and scholarship-based electronic resources
- Development of new models and standards for data management and resource description
- Connecting components to support all stages of research
- Bridging institutional divisions in order to enable interdisciplinary initiatives

A survey has shown that only some 10% of the professionals in the area have received formal training regarding data management (Thomas & Urban 2018). Data types handled by the data librarians are manifold. Text and images are leading. But databases, raw data sets, and computational models play a role in the work life of more than 75% of the respondents (Thomas & Urban, 2018). LIS departments need to react to this new field of employment and decide whether they want to include specific competences into their curricula (Heidorn, 2011; Si et al., 2013).

The LIS community needs to address diversity because of several reasons. Libraries on the one hand are conceptualized as a community space. As communities grow more diverse, their needs and communicating styles are also getting more heterogeneous (Ting-Toomey, 2012; Neuliep, 2018). Often differences e.g. between high and low context communication styles can lead to misunderstandings (Trompenaars & Hampden-Turner, 2011). To manage the library as a community space, some understanding and experience with diversity are necessary. The efforts to include marginalized groups need to be strengthened (Gibson & Hughes-Hassell, 2017). On the other hand, the relation in general between customers of information consumers and information managers gets more heterogeneous. Information managers need to be able to operate in international companies and communities. They need to cope with the diversity of material and enable access to it for all groups.

Audunson has mentioned the need for multi-disciplinarity in LIS education as professionals need to enable access to knowledge in many disciplines (Audunson, 2018). Ramasamy has noted the relevance of a global view for LIS education in India (Ramasamy, 2017).

LIS education at the same time has to deal with different knowledge and entry levels of students. The EINFOSE project has proposed to address this issue with an intensive teaching event (Bosancic et al., 2017). Addressing diversity is also seen in the provision of flexible online learning courses for audiences within LIS and outside the field. The flexibility in creating online courses of different sizes addresses the heterogeneous needs of different audiences. E.g. LIS has reached out to other communities in providing education on information literacy (e.g. Dreisiebner et al., 2017). Such courses include issues relevant for many academic disciplines (search competence, personal information management competences) but also for society (e.g. ethical behaviour, avoiding plagiarism). Examples for such a short online course are presented and discussed by several authors (e.g. Sylvain et al., 2011; Bussmann & Plovnic, 2013; Courtney & Wilhoite-Mathews, 2015).

Innovative LIS curricula can also combine aspects of other disciplines to meet challenges. The degree International Information Management explicitly combines LIS competences with Intercultural Communication in order to train LIS professionals for the challenges of the global dimension of knowledge processes (Mandl & Womser-Hacker, 2001). Dali suggest integrating social work elements into LIS teaching (Dali, 2018) and many US schools offer LIS education in a double degree with another discipline to educate information professionals for a specific discipline (e.g. Indiana University Bloomington).

Increasing the cultural diversity of the teaching staff has been highlighted as a method for addressing some of the challenges. Reaching a more diverse teaching staff can lead to a higher diversity in teaching methods used. It has been pointed out that the faculty members in LIS in the US do not represent the population well (Jaeger & Franklin, 2017).

Solutions can be more international programs. An example for a joint degree between Europe and Korea is presented by Caroli et al. (2018). Such programs allow students to explore different perspectives on the information field, to experience the effects of multiple languages on issues in content representation and to gain intercultural experiences and skills. All of these skills are required in modern information management environments (Neuliep, 2018).

Technology has the inherent potential to allow international collaboration in teaching. For LIS, this has been underlined by Pujar & Tadasad (2016). The authors have explored the topic of MOOCs from the perspective of LIS in India.

The role of technology has changed teaching not only in higher education. This fact has already been stressed in the previous sections on Blended Learning above. The combination of physical presence and digital tools can lead to and more effective learning experiences and optimized learning outcomes. Although the acceptance depends on the country and local learning culture (e.g. Virkus, 2008; Lee et al., 2009; Eke, 2011), the trend can be observed widely. Some issues of technology were already mentioned above, such as the use for blended learning experiences, for more practical teaching and international cooperation. The use of technology for teaching has also the potential to allow more flexible teaching from an organizational perspective but also to support different learning styles.

Video platforms and video based learning accommodates various learning styles. Videos address a combination of senses which leads to better learning experiences (Vural, 2013). The importance of ease of access to the video as a whole and to parts has been stresses. A crucial role for video selection lies in social cues for quality (Loke et al., 2017). The navigation within the video enables an active role for the learner to select specific content. This also allows diverse forms of learning with video which addresses the diversity of the learners (Loke et al., 2017).

Much learning content is provided as open educational resource (OER), OER are a great opportunity for every human worldwide to potentially learn with high quality content (Upadhyay & Upadhyay, 2015). As such, OER may have a long term effect on the digital divide. OER again are a development which supports self-directed learning for diverse audiences. OER are also a challenge for LIS as a form of content which needs to be addressed. LIS professionals need to be able to facilitate user oriented access to learning material (Goswami & Biswas, 2011).

6. EINFOSE Approach to Didactics

6.1. Outcomes of Summer Schools

By Vittore Casarosa and Simona Turbanti

Summer Schools

As stated previously, part of the EINFOSE project activity was the organization of two European Summer Schools in Information Science (ESSIS). The intent of these intensive one-week teaching events was to address BA students planning to enrol in a MA program in Information Science, but not having enough previous knowledge of IS topics. The lectures of the Summer Schools were addressing core areas in LIS, to help students narrowing their knowledge gaps and to prepare them for MA programs.

The first Summer School was held from August 28th to September 1st 2017 in Burg Katlenburg (Germany) and the second Summer School was held from July 1st to July 6th 2018 in Graz (Austria). A one month online pre-assignments and two months of online communication following the ESSIS were obligatory for all participating students. Both Summer Schools included a social program, as an important way to socialize with each other and create a "team atmosphere". The School in Burg Katlenburg included visits to the surroundings of Katlenburg, and the School in Graz included the visit of the historical old city of Graz, the Admont Abbey library, the Gesäuse National Park and the new library of the University of Graz.

Most of the courses at ESSIS were organized as face-to-face lectures, followed by some group work and final collective discussions. The courses covered the four following areas, which are described in detail in the following sections.

- Advances in Information Science
- Research Methodology in Information Science
- Information Seeking and Retrieval
- Evaluation of Information Services

Advances in Information Science
This course was aimed at providing an overview of the birth and development of Information Science (IS) and its future evolution, discussing also its connections to other scientific and academic disciplines and professions. Attention was drawn to the basic principles and special features of the IS, as well as to the main themes which have emerged recently, discussing IS professions and institutions and their values and social role. The course was organized in four parts: Part I - What information science is and is not; Part II - IS professions and institutions: values and social role; Part III - Introduction to organisation of information; Part IV - Semantic Web and linked data

Learning outcomes
Upon completion of the course students will be able to:

- identify the main features of the IS field, its branches, and profiles of information professionals;
- understand and interpret the importance of information services and information institutions, and the tasks the latter provide in a modern society;
- understand the importance of the dissemination of information to various user groups and individuals;

- identify the main approaches with regard to information needs and information use;
- organize and describe simple resources with metadata and linked data.
- apply social skills through participating in group, and teamwork and project work.

Research Methodology in Information Science

This course was aimed at introducing research methods in Library & Information Science (LIS). Two reasons justify a course on research methods in the summer school. First, published research in LIS will expand your understanding of the major issues in information world. In order to read scholarly literature on the topic, you will need some understanding of the main research methods employed in the field. Second, at some point in your academic and professional career, you will need to conduct your own research. You will need to employ research methods adequately if you want to use the results of your studies to make informed decisions that are less biased than guessing or intuition. The course was organized in three parts. The first part presents an introduction to scientific research and scientific information. The second part deals with the different research designs that can be applied to research problems as well as the logic of sampling and statistical tests. This is the core of the course and is divided into two subsections: the most frequently used research designs in LIS field; and the use of both parametric and non-parametric tests. Finally, the third part of the course focuses on (a) examining a research proposal with hypotheses and research design including data gathering and analysis stages; (b) and closed reading of a research article and identifying its research questions, hypotheses tested, findings including results of statistical tests and conclusions. The last part also deals with reviewing the structure of scientific papers including their abstracts, citations and reference lists. The ethical aspects of scientific research will also be briefly discussed.

Learning outcomes

- Understand the scientific research process and get acquainted with the main concepts in research;
- Learn basic research designs and methods used in LIS to carry out research including statistical tests
- Develop skills of analysis and evaluation of scientific research articles.

Information Seeking and Retrieval

This course was aimed at providing an overview of the Information Retrieval (IS). It intended to explain different systems and shows students the advantages and disadvantages of human and automatic indexing. Exact match and partial match systems were explained. The use of systems and the typical processes of users were shown. The collaborative use and some specific systems for searching together were shown. The organization of information was discussed in more detail than in the introductory part, followed by a discussion of users, their needs and behaviour, as well as user types.

The course was organized in four parts: Part 1 - What is Information Retrieval? Information retrieval systems; Part 2 - The search process. Phases of the search process; Part 3 - Introduction to organisation of information. Users of information retrieval systems, their needs and behaviour; Part 4 - Introduction to Collaborative Information Seeking (CIS) and Retrieval (CIR)

Learning outcomes

Upon completion of the course students will be able to:

- know about main differences of Information Retrieval systems
- understand basic ranking algorithms
- understand the relation between knowledge organisation and search systems
- know about controlling the search process
- know about typical issues of user behaviour
- understand collaboration in searching
- know systems for collaboration

Evaluation of Information Services
This course was aimed at providing an introduction to various evaluation approaches relevant for LIS. After a short introduction about evaluation in general, the course went into more details on how to apply it in different areas of LIS. The course was organized in four parts and two workshops: Part 1 - Introduction to evaluation (in general); Part 2 - Evaluation of information services (and libraries); Part 3 - Evaluation of information retrieval systems; Part 4 - Evaluation of research; Workshop 1 - Performing a (rough) evaluation of a concrete information retrieval system (IRS) such as BASE, Google Scholar, TED, Espacenet; Workshop 2 - Presentation of evaluated IRS and results of the evaluation.

Learning outcomes

- understand and interpret the importance of information evaluation
- identify the main evaluation areas in LIS
- utilize appropriate methods and techniques in the measurement and evaluation of library/information resources and services
- understand the reasons for evaluation and types of evaluation
- select suitable evaluation methods, instruments, and indicators in relation to them
- design and use appropriate methods and techniques in the measurement and evaluation
- performing an evaluation of an information retrieval system

Summer School Evaluation

At the end of each School a questionnaire was presented to the students to get their evaluation of the Summer School and to understand the aspects that could be improved in possible future editions. In addition to demographic data, the questionnaire investigated previous educational background and future intentions. Furthermore, the evaluation of courses, work-load, length, teaching methods of summer school were requested. In the following we present a summary of the data collected from the questionnaires and a summary of the feedback received from the students.

In ESSIS 2017 there were in total 21 students enrolled (see below the country distribution), but in the end, for different reasons, only 15 questionnaires were completely filled. In ESSIS 2018 there were a total of 17 students enrolled, and in the end a total of 16 questionnaires was completely filled. The charts below provide an indication of the students' provenance and age. Figure 3a and 3b show the students' background, where "rel-IS" means "previous studies were somehow related to IS". From Figure 3b it can be noted that the 2018 edition of the School was addressing much better the main purpose of the school, i.e. to "fill the gap" between the previous studies and the possible future studies related to Information Science.

A number of points in the questionnaire were concerned with an assessment of the Summer School, from the point of view of the organization and from the point of view of the contents. Most of the questions were requesting an assessment in a scale from 1 (bad or completely disagree) to 5 (good or completely agree).

For what concerns the organizational aspects of the School, averaging the answers to the questions related to the different aspect of the organization (venue, facilities, accommodation, social program, food, transport) we get the results shown in figure 4a and 4b.

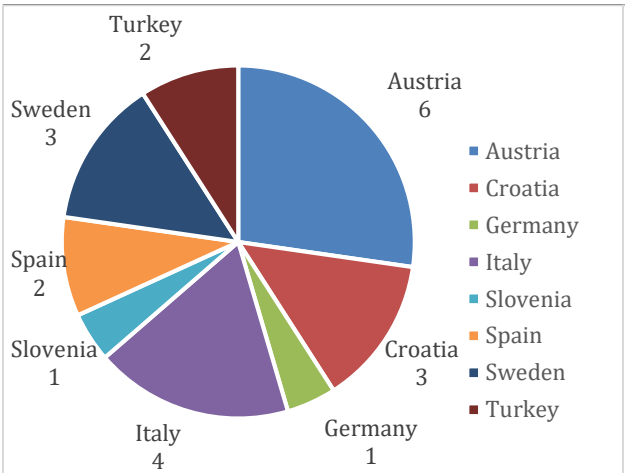

Fig. 1a: ESSIS 2017 Country distribution

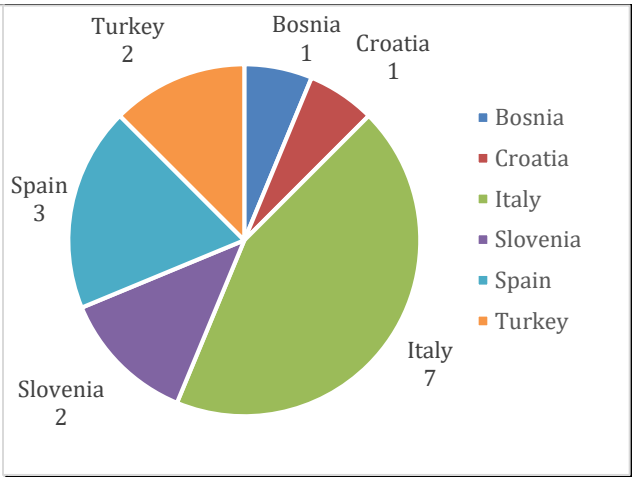

Fig. 1b: ESSIS 2018 Country distribution

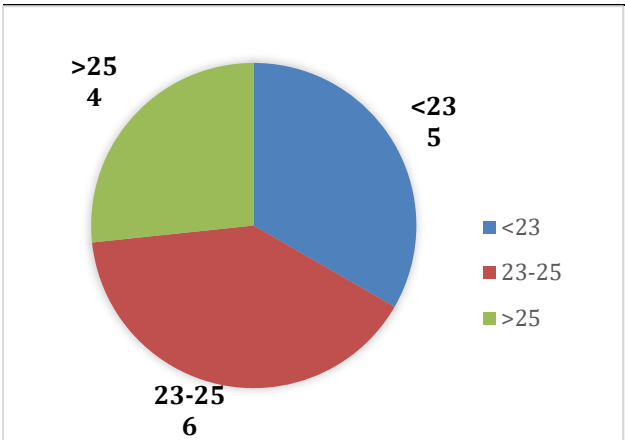

Fig. 2a: ESSIS 2017 Age distribution

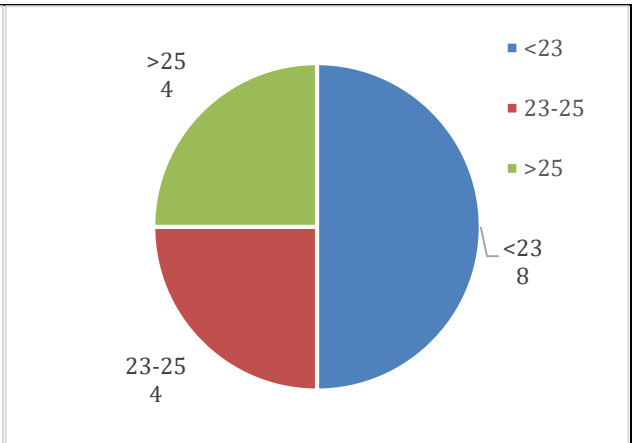

Fig. 2b: ESSIS 2018 Age distribution

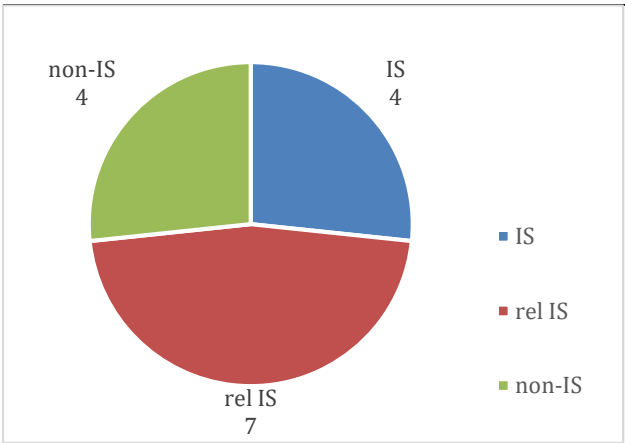

Fig. 3a: ESSIS 2017 Previous education

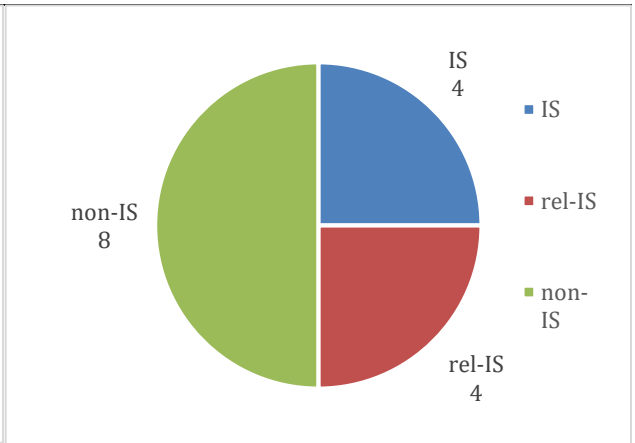

Fig. 3b: ESSIS 2018 Previous education

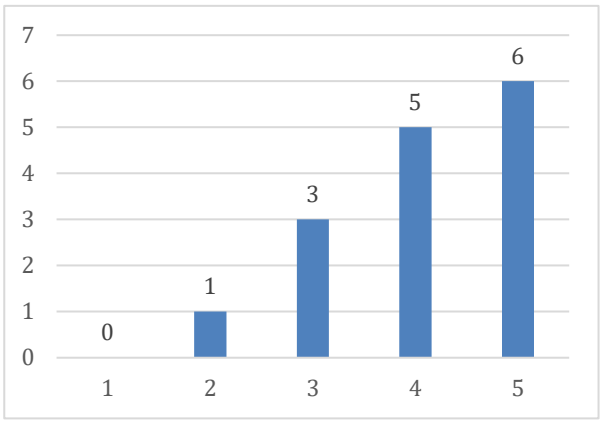

Fig. 4a: ESSIS 2017 Overall organization

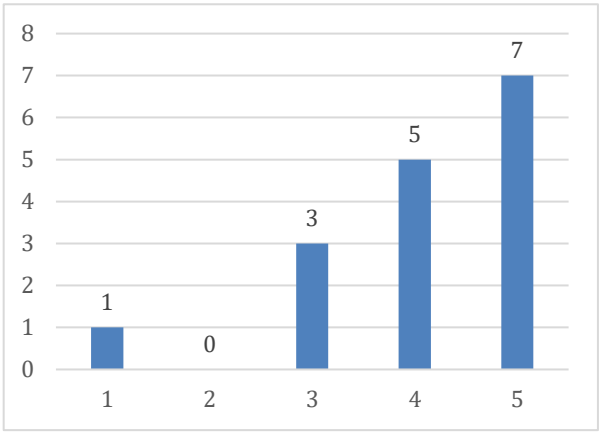

Fig. 4b: ESSIS 2018 Overall organization

In ESSIS 2017, for each one of the four courses, the students were requested to assess their agreement (score 5) or their disagreement (score 1) with the following statements:

- Topic was interesting.
- Presentation of the topic was appropriate.
- Lectures were understandable and easy to follow.
- Practical examples were interesting.
- Students were engaged in discussion.
- I learned new things.
- Pre-Summer School assignments were useful.
- Teaching methodology(ies) was/were appropriate.
- Course materials were well prepared and/or adequate.
- Lectures were adjusted to the level of my prior knowledge.

The graphs below (Fig. 5a, 5b, 5c, 5d) show the overall assessment for each course, averaging the answers to the ten questions above.

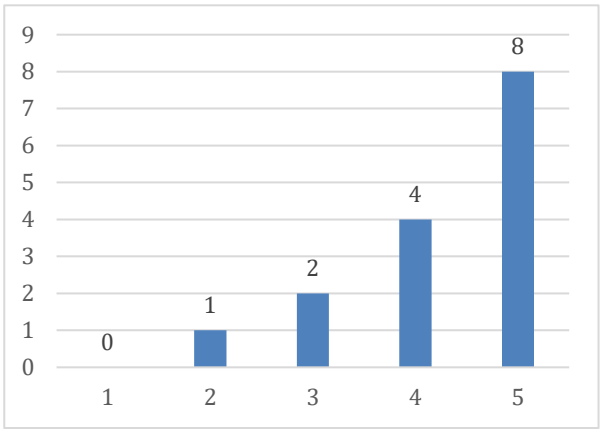

Fig. 5a: ESSIS 2017 Overall assessment of Advances in information Science

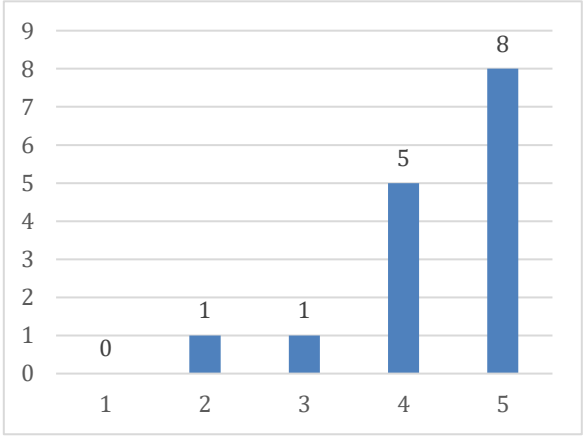

Fig. 5b: ESSIS 2017 Overall assessment of Research methodology in IS

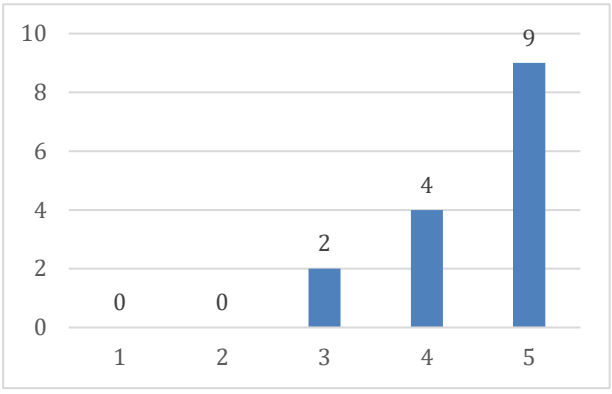

Fig. 5c: ESSIS 2017 Overall assessment of Principles of information seeking and IR

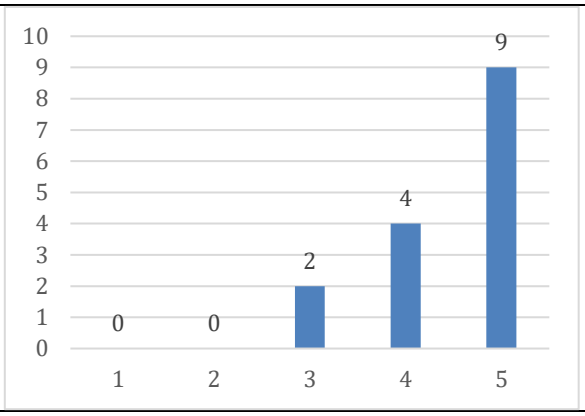

Fig. 5d: ESSIS 2017 Overall assessment of Evaluation of Information Services

In ESSIS 2018 the statements about the four courses were slightly simplified, but following the same idea of expressing agreement (score 5) or disagreement (score 1). The statements for ESSIS 2018 were the following:

- Length of the presentation
- Subject coverage
- Usefulness of the topic
- Appropriateness of the level
- Balance between practice and theory
- Connection between practice and theory
- Level of novelty (I learnt new things)
- The way teacher presented the topic

The graphs below (Fig. 6a, 6b, 6c, 6d) show the overall assessment for each course, averaging the answers to the eight questions above.

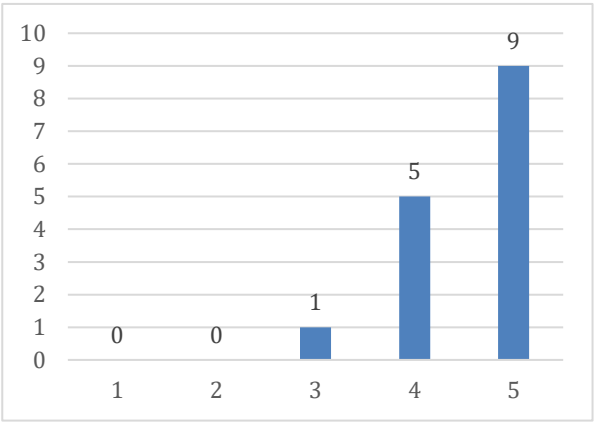

Fig. 6a: ESSIS 2018 Overall assessment of Advances in information Science

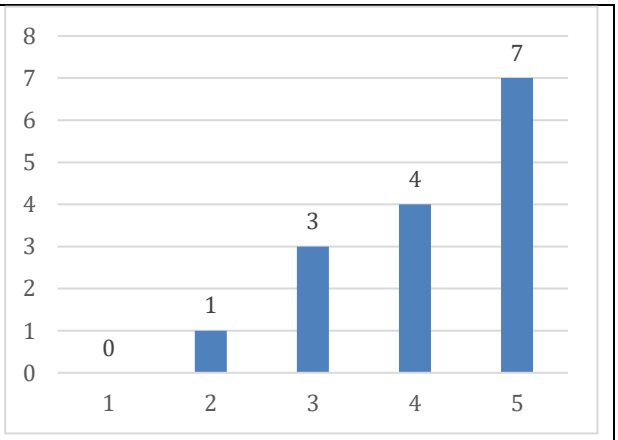

Fig. 6b: ESSIS 2018 Overall assessment of Research methodology in IS

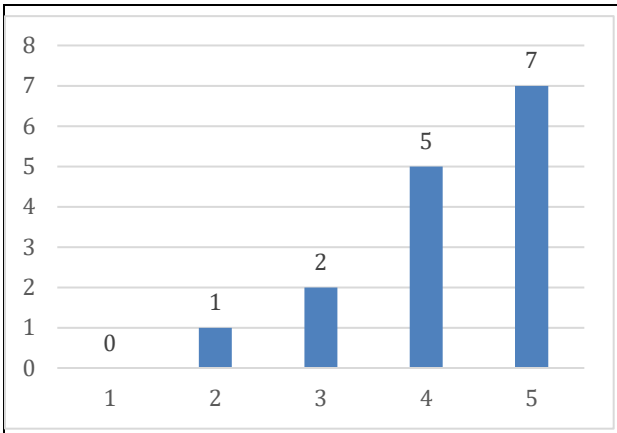

Fig. 6c: ESSIS 2018 Overall assessment of Principles of information seeking and IR

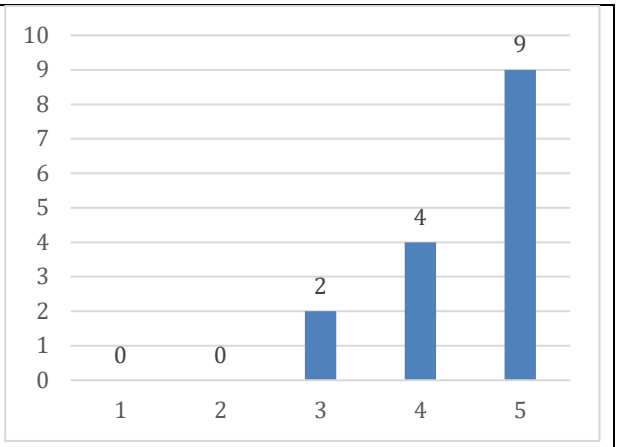

Fig. 6d: ESSIS 2018 Overall assessment of Evaluation of Information Services

The next points in the questionnaire were aimed at getting some feedback about the length and the workload of the School. The outcome is shown in figure 7 and 8.

Fig. 7a: ESSIS 2017 Length of the School

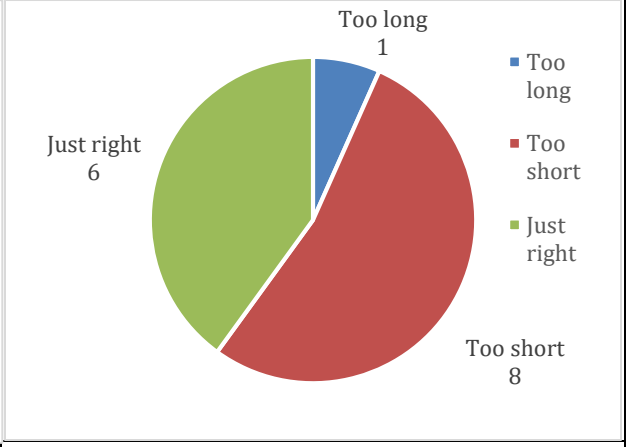

Fig. 7b: ESSIS 2018 Length of the School

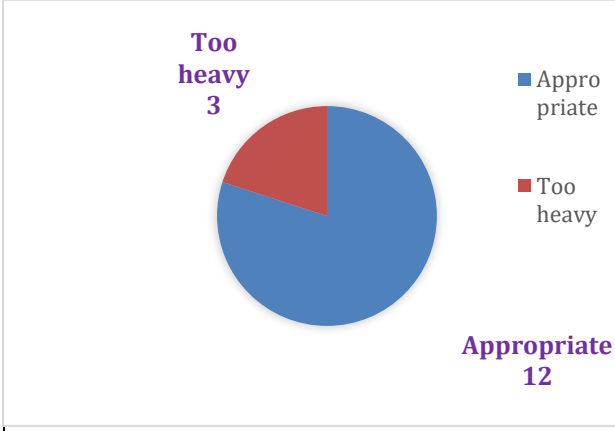

Fig. 8a: ESSIS 2017 Workload

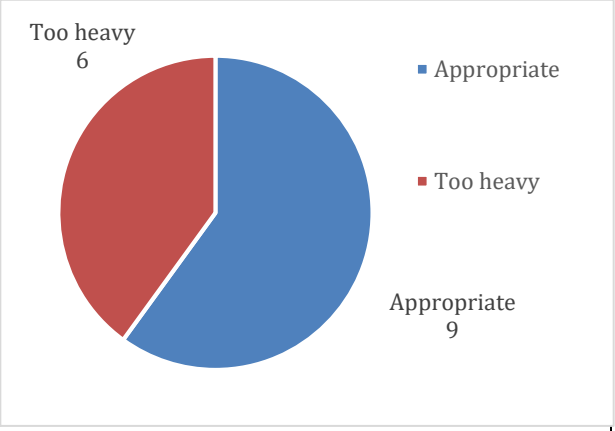

Fig. 8b: ESSIS 2018 Workload

The last point in the questionnaire was asking an assessment of how much the students were feeling that they had achieved the Learning Outcomes of the school. As in many of the previous questions, the students had to express their agreement (score 5) or disagreement (score 1) with a number of statements. In ESSIS 2017 the statements were the ones listed below, and Figure 9a shows the overall assessment, averaging the scores over the 7 statements.

- I gained new insights
- I learned new tools for solving problems
- I am able to better combine new knowledge and draw conclusions
- I appreciated the communication of new theories and tools, and the relevant conclusions that could be drawn from that
- I improved my learning skills
- I am more able to solve problems in a group of international students
- I understood better the professional terminology

In ESSIS 2018 the statements were increased and more articulated, as listed below. Figure 9b shows the overall assessment, averaging the scores over the 9 statements.

- Ability to identify the main features of the IS, its branches, and profiles of information professionals
- Ability to understand and interpret the importance of information services and information institutions, and the tasks they provide in a modern society
- Ability to understand the importance of the dissemination of information to various user groups and individuals
- Ability to identify the main approaches with regard to information needs and information use
- Ability to identify and evaluate those information resources necessary to perform a particular informational task
- Ability to demonstrate knowledge and skills in the areas of search and retrieval of information
- Ability to understand the basic principles of information organization
- Ability to utilize appropriate methods and techniques in the measurement and evaluation of library/information resources and services
- Ability to apply social skills through participating in group, and teamwork and project work

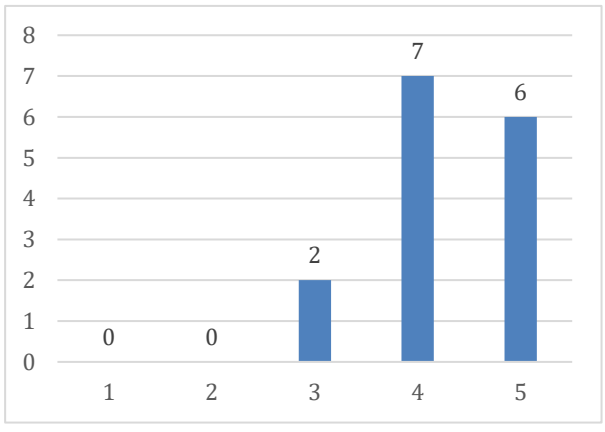

Fig. 9a: ESSIS 2017 Learning outcomes

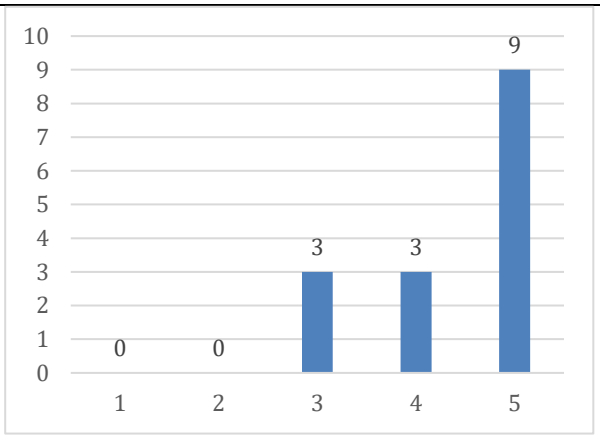

Fig. 9b: ESSIS 2018 Learning outcomes

Finally, the graphs below (Fig. 10a and 10b) show the overall assessment for each summers school.

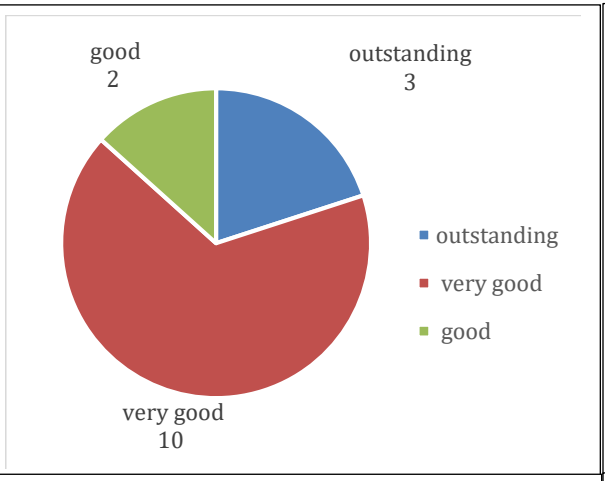

Fig. 10a: ESSIS 2017 Overall assessment

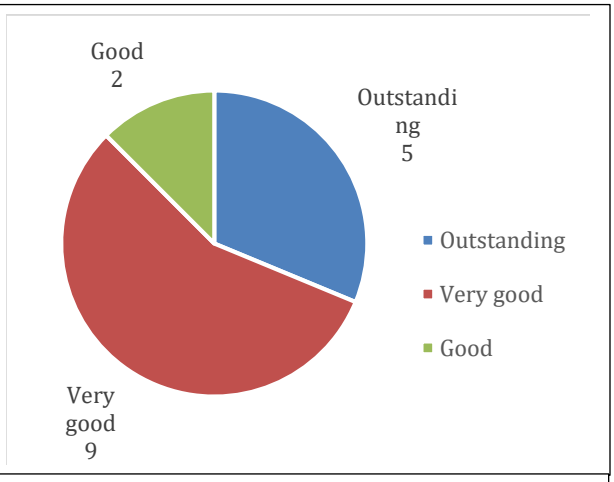

Fig. 10b: ESSIS 2018 Overall assessment

Suggestions for Improvement

The questionnaire was concluding by soliciting suggestions and asking the personal preferences about the teaching method(s). Here below is a summary of the main students' responses.

ESSIS 2017 - Which teaching methods would you prefer for Summer School?
Lectures combined with group assignments; group work, group competitions in quizzes; lectures combined with students' discussion and exercises; more practical assignments, because through them, you get to understand the theoretical part better; presentation and group work; lecture and occasional presentation leading active participation; PowerPoint presentations and group work; students' collaboration to also time to present their slides and ideas.

ESSIS 2017 - Suggestions for improvements and/or comments:
Short breaks between the lectures; it might be better to have a social program on the second day in order that all students and professors get to know each other; maybe that in the final day (or one of the days) topics could be divided in two groups: libraries related one group and engineering the other group; more time to express our own views and for group discussion on specific topics; the summer school should definitely last longer, at least for one full week, not counting the arriving and departing days; lecture time was a little bit long and sometimes professors gave group work before lunch and we had to present it after lunch. There was not enough time to prepare. Next time it would be better if lectures are shorter or there are breaks in between.

ESSIS 2018 - Which teaching methods (lectures, games, videos, team work, etc.) would you prefer for learning?

The team work; mixed lectures of theory and practice; games, team work and exercises; videos used during lectures, more participation; lectures; lectures plus video; interactive lessons; team work after the lectures

ESSIS 2018 - Suggestions for improvements of the Summer School
A little bit shorter presentations regarding theoretical concepts; the lectures need to be shorter because students are not able to concentrate for an hour and a half; some professors talked about topics that we have never heard about and expected us to solve difficult assignments; harder subjects should have more time for teaching than the basics; It would be better if the summer school were 10 days or two weeks long so the lessons could be organized more efficiently and students could have more breaks and time to process everything they have learned and to have more time to socialize; more social activities; more time for group activities, especially in the afternoon or with hard topics; the exercises in group are perfect for understanding; increase the hours of lectures concerning humanistic studies.

ESSIS 2018 - Additional comments:
The summer school was very informative and educational; it should be repeated every year; building connections with other future information specialists was unique; it was a great experience; I found new professors that teach in a different way, and I learned how I can connect IS with my education studies; it was a pleasure to learn a new way of thinking and approaching a new science and living this experience; I think that the Summer School is a great project in which you can learn the basics of the information science if you are not studying them yet or in my case you can extend your knowledge. I think the team works and social events were the best part of the Summer School.

Conclusions

The organization and running of the two summer schools has been a very valuable experience for the EINFOSE project. First of all, following the high level description that had been provided in the project proposal for the four courses to be delivered during the Summer Schools, the partners did develop a detailed definition of the contents of each course, providing an overview of the main topics underlying each course, as summarized below.

- Advances in Information Science
    - What is Information Science? and What is not? What is Information?
    - IS professions and institutions: values and social role
    - Introduction to organisation of information
    - Semantic Web and Linked Data

- Research Methodology in Information Science
    - Introduction to scientific research
    - Research Design, Sampling and Statistical Tests
    - Examining a Research Proposal and Close Reading of a Research Paper

- Information Seeking and Retrieval
    - What is Information Retrieval? Information retrieval systems
    - The search process. Phases of the search process

    - Introduction to organisation of information. Users of information retrieval systems, their needs and behaviour.
    - Introduction to Collaborative Information Seeking and Retrieval

- Evaluation of Information Services
    - Introduction to evaluation (in general)
    - Evaluation of information services (and libraries)
    - Evaluation of information retrieval systems
    - Evaluation of research

For the second edition of the Summer School (ESSIS 2018) the detailed content of each course was adjusted and refined based on the feedback and comments received after the first Summer School (ESSIS 2017).

Another point to be highlighted is that the rather "traditional" didactic approach of a front lesson with slides (and/or video) followed by group exercises and then followed by presentations from the groups and possibly a general discussion has proven to be very well appreciated by the students, based on their feedback.

Finally, the two main "criticism" that might be derived from the comments and suggestions for improvements are to increase the time dedicated to group work and practical exercises and to increase the length of the school (or alternatively to decrease the workload in each day).

For the first point (more time dedicated to group work and practical exercises) we can say that ESSIS has tried to achieve the best balance between theory (lessons) and practice (group work). It is true that practical exercises are needed to better understand the theory and to get a complete knowledge of some topic, but in the case of ESSIS the main objective of the school was to provide a basic knowledge of the main topics in Information Science (filling the gap) and not to make the students proficient in each one of the topics presented. The group work and the practical exercises were just those needed to help the students understand and assimilate the topics presented.

For the second point (workload too heavy) it is always difficult to understand to what extent the load is really too heavy and to what extent the complaint is due to the very common student attitude of trying to get as much as possible with the minimum of effort. For the case of ESSIS, it is probably true that the advertising and the "recruitment" of students had not stressed enough the point that the school was going to be an "intensive" one, in order to fill a (possibly) wide knowledge gap about topics in Information Science, in just one week.

In any case, all the EINFOSE partners will capitalize on the experience gained by running these two summer schools in the definition and delivery at their own University of courses related to Information Science.

6.3. Outcomes of Didactic Workshop

By Serap Kurbanoglu, Alen Doracic and Kornelija Petr Balog

A two days workshop titled *New Approaches to Teaching and Learning in the Digital Environment* was organized between October 19-20 October 2017 at University of Borås, Sweden within the EINFOSE Multiplier Event framework. Twenty-eigth people from different countries participated (15 faculty, 4 students and 9 project team members) in the workshop. Programme included several presentations, a panel discussion and a workshop outcomes of which will be discussed below.

Presentations

Presentations covered areas such as LIS education in the light of professional developments and trends, 21st centry skills and successful strategies for teaching these skills, analysis of strengths and weaknesses of the learning outcomes model applied in LIS area, and MOOC as an alternative training activity. Each presentation provided a solid background for the following panel discussion and the recommendations for the didactic framework.

Educating LIS Students for Crafting Professional Growth
Zinaida Manžuch, Associate Professor, Digital Media Lab, Faculty of Communication, Vilnius University, Lithuania

Studies about library role and trends, workforce and employment situation highlight an importance of innovative librarians, leaders and efficient teams to shape the successful future of libraries all over the world. Ability to act as an agent of change, develop new tasks and reframe the old ones, establish and maintain wide professional networks and employ them to initiate new projects – these are just few examples of features desired from a contemporary librarian. In turn, library and information (LIS) students search for the ways of getting a flavour of the profession, connecting it to personal goals and aspirations, making a solid ground for being competitive at the labour market. These requirements and needs do not easily fit into traditional model of learning outcomes and competencies provided by LIS higher education schools. This gap is also felt in the initiatives to develop new LIS curricula. Basing on a personal experience of combining my university teacher and library deputy director career and recent developments in LIS research and curricula I would like to speak about providing LIS students with career competencies that enable them to fit the demands of the labour market and to develop a meaningful career path. The concepts of career competencies and job crafting will be introduced, examples of initiatives and methods (i.e. mentorship, volunteer work etc.) for delivering such competencies will be discussed in the presentation.

Teaching for 21st Century Skills?
Jasmina Maric, University of Borås, Sweden

This study offers a brief analysis of teaching 21st century skills at Web Content Manager and Designer Program at the University of Borås. Therefore, we started with a thorough literature review to understand what 21st century skills are. After presenting the consensus on this matter we juxtaposed 21st century skills with six problems faced by students observed in teaching practices. Looking for successful strategies for teaching 21st century skills we offered examples from recently applied teaching practices to cater for developing 21st century "super skills". Finally, this study argues that much more research in the field is needed. It is impossible to advocate for changing the education without knowing whether current changes were effective. Keeping that in mind, this study can be useful as a good starting point when discovering factors that drive the motivation of adoption of 21st century skills.

Pedagogical Issues in International LIS Education: The Learning Outcomes Based Approach Strengths and Weaknesses
Anna Maria Tammaro, DILL International Master Digital Library Learning, University of Parma, Italy

The use of learning outcomes in the European Higher Education Area is intimately linked to the adoption of student-centred learning approach, with the role of the teacher moving towards being a facilitator/manager of the learning process. There is a consequent cascade effect that links the learning outcomes orientation with the selection of appropriate teaching and assessment techniques and the development of suitable curriculum design. The presentation analyses strengths and weaknesses of the learning outcomes model applied in LIS area.

Is MOOCs an Alternative?
Nasrine Olson, University of Borås, Sweden

Massive Open Online Courses (MOOCs) were first introduced in 2006 and have since gained momentum. Today over 700 universities offer around 7000 courses attracting over 50 million students. This presentation discusses experiences gained in producing a MOOC as part of the training activities within a large EU funded project. Points of discussion include: selection of platform, process time-line, difficulties that may arise, potential opportunities, audiences reached, lessons learned and more.

Panel Debate

Several participants took place in the panel debate which was based on personal experiences and observations focusing on didactics in particular and LIS education in general. Both faculty and students from several LIS schools/departments from different countries took part in panel debate. Main points from debates are listed below:

- LIS is interdisciplinary. A stronger inderdisciplinary approach is needed in LIS schools. Thus LIS education requires instructors from different sectors. This brings the challenge of bringing together different sectors.
- There are some challenges for distance education such as lack of communication, discussions, complex content for students to learn by themselves (e.g. statistics). That causes big drop out rate from the online course. Detailed video tutorials with detailed account of possible errors work well with distance learning. Students need constant communication, short videos and discussions.
- LIS students resist to learn some subjects which are very useful for them, such as programming. Measures should be taken to make these subjects/lectures more attractive.
- Undergraduate programmes generally provide an introduction to LIS field, however did not offer deeper knowledge. There is a need to make a clear connection between theoretical knowledge and library practice. It is also important to have a good balance between theory and hands-on practice.
- Developing social skills, networking (meeting other students from abroad and exchanging experience), team work, group discussions, active learning (having discussions during the lectures), commmunication are important but it is a challenge to have these skills developed.
- Learning to learn (life-long learning skills) is the most important competence for 21st century. That is the only way of coping with change.
- It is important to have support from the university administration. With such a support it is easier to introduce different teaching methods such as project based learning.
- Creating opportunities to bring together career-planing people and students help students to understand the skills required by employers and poisitons available in the job market. That would be a good motivation for students to develop their soft skills and focus on the skills required by the job market.
- Phychological health and physical well-being are as important as ethics and values. Generaly teachers do not know how to deal with certain situations (student tries to commit suicide; student has a nervous break-down in the middle of the classroom). Psychological knowledge/skills are especially needed by university instructors. Teacher training regarding this issues is important. Peer-evaluation for novice tachers would be useful.
- There should be a harmony between professional skills and 21st century skills. Skills are important however knowledge is at least equally important. If the subject is not known, how one can be critical about it? Therefore, having a basic theoretical knowledge of the field is important before working on

the improvement of 21st century skills (e.g. critical thinking, communication, creativity, etc). Nobody can develop a whole set of 21st century skills. Certain skills (depending on personal features and opportunities) should be focused. Forinstance, team work is one of the most important skills.

- Students are seldomly aware of their competences. Self-awareness is an important factor for motivation and career planning.
- Students generally thought what it is like to be a librarian. However, this might prevent them to be flexible, innovative and adaptable to other work environments in which they could succeeed with the knowledge and skills they gain during their education.
- Misconception what LIS is about (e.g. only libraries) could be a problem both from instruction's side and students' side.
- While evaluating LIS programmes to what extent we should rely on students' feed-back is an important question to answer. Although it is useful to get their feedback, one should also keep in mind that students cannot always judge what (in what dept) should be taught at LIS schools.
- Change in teaching methods is necessary because it leads to better learning outcomes not only because we are dealing with a 'new generation. New generations might not be, afterall, so different from previous generations.
- Students should be active in classroom. They should be involved more. That should definitely increase the chances to meet learning outcomes.
- Skilled teachers are needed. Teachers can only teach their students the skills they own themselves. Continuos teacher training should be considered.
- LIS faculty generally have a clear idea about what to teach, but not necessarily on how to teach. That is mainly based on lack of pedagogical knowledge. This can be another important subject for teacher training.
- Teachers should change their teaching approaches depending on the courses they teach. Certain methods give better results for teaching certain subjects. Use of a combination of various types of teaching methodologies is important. This also helps to address the issue of having students with different learning styles.
- Students generally have problems with grasping abstract problems. This might require a special attention.
- On on ehand, students seem like lack of curiosity and not interested to learn new things. On the other hand, teachers are not willing to change their teaching methods and gain new skills. There might be a connection between these two problems. Change of teaching methods might help with increased student interest. Children are curious by nature but become passive when they enter the educational system – there is something wrong with the system. This should be investigated.

Critical Thinking Workhop on Instructional Methodologies

Partipants (20 experts from different countries) divided in four groups (5 people in each group) and each group has choosen one instruction method (such as Learning by Teaching, Seminar Discussion, Flipped Clasroom and Gamification) based on their personal experiences to be able to make reflections. Group discussions lead to a presentation to the whole group which summarised the discussions and conclusions by a representative from each group. Group presentations lead to further discussions which were very much in line with what is referred in the literature and provided a kind of confirmation.

The critical thinking workshop was organized in an Active Learning Classroom newly opened at University of Borås. That was a very good first had experience for participants.

Active Learning Classrooms (ALCs) "typically feature round or curved tables with moveable seating that allow students to face each other and thus support small-group work. The tables are often paired with their own whiteboards for brainstorming and diagramming. Many tables are linked to large LCD displays so students can project their computer screens to the group, and the instructor can choose a table's work to share with the entire class. Wireless Internet plays an important role in retrieving resources and linking to content management systems, and depending upon the size of the room, table microphones can be critical so that every student's voice can be broadcast across the room" (Baepler et al, 216, p. 10).

In practice, considerable variation in the levels and combinations of low and high technology persist due to costs, infrastructure, and goals. Regardless, the principles governing room layout/design, furniture, technology, and other features are that of active learning pedagogical approaches.

The majority of classrooms in use today were built for traditional, "stand-and-deliver, sit-and-listen" pedagogies in a passive learning setting. Inflexible layouts and furniture with limited mobility hamper interaction among students, instructors and content; in fact, the environment is the barrier. Technology access is highly variable from classroom to classroom and often poorly integrated. Instructors and students cannot easily leverage technology—either built-in or portable – to support problem-based pedagogies and hands-on learning. Today we have to reconsider how pedagogy, technology and space can be better integrated for a greater impact on teaching and learning.

Design Tips for New Classrooms

Pedagogy

- Design to support fluid transitions among multiple teaching modes: lecture, team project, discussion, etc.
- Design for peer-to-peer learning.
- Allow freedom of movement for the instructor, enabling frequent interactions and ongoing assessment.
- Support the implementation of professional development to increase adoption of new teaching strategies.
- Set expectations for what an active learning environment looks like— learning is messy, things move.
- Expose students to how these environments enable, support and allow them to take ownership of their learning.
- Support individual learning

Technology

- Design for sharing, leveraging both vertical and horizontal surfaces for display; use projection and interactive surfaces.
- Integrate, use and allow access to BYOD and instructional technology tools and devices.
- Allow for displayed information to be persistent over time.
- Ensure thoughtful planning occurs when selecting technology so the tools are used as intended to enhance outcomes.
- Be intentional about what technologies should be used and how to support pedagogical strategies.
- Incorporate tools that support synchronous and asynchronous learning and collaboration.
- Support learning styles with both analog and digital means to co-creat

Space

- Design for visual and physical access, giving every student the best seat in the house and allowing the instructor and student access to each other.
- Facilitate social learning by designing spaces where students can easily connect and collaborate.

- Design to support quick reconfiguration among multiple modes: from lecture to project work, discussion, test taking and back again.
- Include wall protection for table and chair movement.
- Support a range of postures to enhance wellbeing.
- Integrate the design to support and reflect the educational goals and mission of the institution.

7. Conclusions and Recommendations

By Serap Kurbanoglu

Library and Information Science (LIS) being a discipline in flux requires LIS education to be transformed. Today there is a trend in LIS education towards an increasing focus on ICT, users perspectives, and multi-disciplinarity. Multidisciplinary nature of the disicpline requires drawing attention of the graduates from other disciplines. The debate over the education in general and how to further increase the demand from graduates of other disciplines is intensifiying. New career opportunities for LIS graduates are opening in areas such as knowledge management, information architecture, research data management and digital humanities. All these developments require some strategic decisions such as the changes in the structure, scope and focus of LIS programs.

There is also a progressive change from teacher-centered pedagogies and practices towards student-centered and more personalized learning in education. Millennials, raised with information technology have a preference for environments that support multi-tasking, group work, and engagement with the social aspects of learning. In response to the expectations of Millennials, LIS education institutions should recognize that in order to promote learning, maintain student engagement and increase student satisfaction not only the wise utilization of technology but also use of innovative pedagogies are inevitable.

A pedagogical framework is defined by a specific set of tasks, by a certain social setting and by a sequence of didactics methods. Nowadays, it calls for a sensitive pedagogical designs that could harmonize expectations by both teachers and students. By offering a thinking space to learners, teachers seek for an optimal iterative methodology to provide a learning environment that could support creativity and foster in classroom or/and online activities. There is no doubt that changing teaching practices have to fit specific pedagogical and learning objectives, and that should be constantly evaluated through macro and micro-design research.

The appearance and rapid spread of numerous technical resources are not enough by themselves to realize an educational reform. Placing new resources in the framework of an old model does not constitute innovation. One of the challenges education systems are facing in general is how to change the teaching habits and distrust in regards to the use of ever growing new models and educational online systems. Introducing new teaching models and methods help however provoking also wide-spread teacher change which is also necessary. It is inevitable to change the approach based upon chalk-and-talk method.

The EINFOSE project aims to develop educational guidelines and recommendations for LIS/IS education. Investigating ways and means of lowering barriers to the students' enrolment at graduate programs in LIS/IS and attracting students from other disciplines is among the project's goals. One of the five main intellectual outputs (IO) of the project is to develop a didactic framework based upon theories, principles, recent trends and summer school experiences that could support new visions for HE in 21st century. Conclusions and recommendations listed in this section are expected to be useful not only to improve EINFOSE summer school but also to be helpful for any LIS education program by providing a didactic framework.

- Since LIS is a discipline in flux and there are new positions opening up for LIS graduates it is necessary to revise and update ILS education programs accordingly in regular intervals.

- Following up the advances and developments in the field of didactics and developing a didactic framework are necessary to promote learning, maintain student engagement and increase student satisfaction which are required for student involvement and success.

- A more student-centred approach to instruction and the new role of the teacher who was not seen only as the direct transmitter of knowledge, but rather facilitator of an active, self-directed construction of knowledge, in other words *constructivism,* and use of instructional approaches which are based on constructivism are recommended.

- Transformative pedagogy approach should be applied to encourage teachers to do much more than transmit information. Transformative pedagogy seeks to change students' attitudes and analytic skills to facilitate their growth, regardless of whether the course is delivered through a traditional or online format. Basically, it aims to critically examine students' assumptions, to explain how they cope with social issues, and engage in social action.

- Educators should provide with effective ways to involve their students in experiential learning partnerships through the use of alternative platforms and channels such as serious gaming, e-books, crowdsourcing, and social media.

- The traditional methods of instructing students – such as memorization, repetition, and basic comprehension – are no longer sufficient. Today's students have vastly different interests, skills, and brain functions that are not always recognized or attended to within many education systems. Pedagogies used should address Millennial learning preferences, and start to combine the traditional face-to-face classroom instruction with new instructional trends such as blended learning, flipped classroom model, online instruction, video based instruction and MOOC.

- Blended learning is commonly defined as a combination of the traditional face-to-face and technology-based instruction delivery methods. Rather than replacing face-to-face lecture delivery with online delivery, in blended learning the online component is usually used as a complement of the in-class lesson. The ultimate goal of it is to promote active and self-directed learning opportunities for students by joining the best features of face-to-face in-class instruction with the best features of online instruction. Blended approach is utilized in EINFOSE summer schools with some pre- and post- summer school activities online and face-to-face training in the classrooms during the summer schools. Students benefited from the advantages of both methods. Same approach is recommended for future summer school programmes.

- A form of blended learning is flipped classroom. The flipped classroom refers to a teaching method (a pedagogical model), that delivers the lecture content (interactive videos or tutorials) to students before the class for them to study on their own time and uses class time for practical application activities where students review and apply what they have previously learned. The objective of the flipped classroom is to engage students in active learning by having them apply core concepts to a variety of contexts in order to more effectively build concepts into their knowledge base. It seems like a very appropriate approach for short summer school programmes where time spend in the classroom is limited. This approach also fulfills the requirement of students for more practical work. It is highly recommended to be taken into consideration for the future summer schools.

- Gamification is another approach to facilitate learning. It is based on the assumption that people like to play games since they usually are fun and engaging. Gamification is using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems. It is a new didactic approach which addresses the needs and likes of millennials. Can be considered to be used. However, objectives and learning outcomes should be very well planned.

- The Internet has provided a new online learning environment and brought new situations with growing number of OERs, MOOCs, teachers and global learning challenges. The new environment allows students to select the content they prefer, and decide the time and place for learning.

- Massive Open Online Courses (MOOCs) are a relatively recent development in higher education. Online educational programs, OERs (Open Education Resources), MOOC and video content creation and delivery can enable the implementation of flexible and personalized learning spaces required by Millennials.

- In the past few decades, technology has brought enormous changes to how higher education is delivered. In the first place, distance education allowed students to learn without physically attending training activities, but using materials delivered to their homes. At a later stage, following suit of the principles of the free software movement, open education has claimed for the adaptation, sharing, remixing and collaboration in the elaboration of teaching and learning materials. Most initiatives in this field have promoted the creation of Open Educational Resources (OER). EINFOSE has also contributed to the OERs in the fild of LIS with four core subject area with the involvement of experts from partner countries.

- MOOCs are online courses with unlimited enrolment in terms of number of students delivered through the Internet. MOOCs as being: massive ―registration is not limited, with thousands of students enrolled, although some MOOCs have pre-requisites and for-fee registrations, examinations or certificates of completion―; open ―taking advantage of widely available OER―; online ―without requirements for face-to-face attendance―; and course ―the concept of a pedagogically designed learning journey―. MOOCs are characterized by free access, adaptation, remixing, sharing and collaboration. A list of MOOCs delivered in the field of Library and Information Science (LIS) is compiled in this report. It is highly recommended to take advantage of what is already available when developing LIS programmes. The content of the MOOCs available should be addressed in the related part of education programmes.

- It is also worth of noting that 21st-century learning skills and competencies looked for from the perspective of employers mainly are based on philosophies of communication, collaboration and creativity, as well as on their need to employ workers who will be able to tackle and deal with ever growing challenges in modern economy. It is important to help learners by developing programmes which equip them or help them to improve 21st century skill such as critical thinking and problem solving; collaboration and leadership; agility and adaptability; initiative and entrepreneurialism; effective oral and written communication; accessing and analysing information; and curiosity and imagination.

- Attempts should focus on how to infuse 21st century survival skills in the education programmes probably through classroom and on-line practices. Development and utilization scientifically based measures for these skills are also recommended. This should become an important part of the didactic framework. To ease the way these skills might be introduced into didactic frameworks, teachers should think how to make their teaching relevant and at the same time permeating across the disciplines, develop of thinking skills and encourage learning transfer. Not less important is to teach students how to learn, work in teams and foster creativity. The teachers should also constantly exploit technology to support learning.

- Students' needs, interests, and personal features such as their backgrounds and learning styles are to be taken into consideration and to be placed at the center.

- Cognitive factors are commonly referred to as those variables that can explain the differences in the behaviors of individuals in learning situations (such as thinking, problem solving and learning). While developing didactic frameworks more attention should be placed on factors and models in the field of cognitive activity, especially cognitive, learning and thinking styles. Cognitive styles can be defined as types of human information processing, while learning styles denote the use of cognitive features in learning. In certain situations, these strategies are more, and in some cases less appropriate and efficient. In addition to strategies, defined as combinations of mental operations that individuals use in a concrete learning situation, learning styles also include emotional-motivational components (goals, intentions) and perceptions of learning (mental learning model). Since cognitive factors (such as cognitive, learning and thinking styles) has an impact on learning, and in summer schools since it is not possible to get more information about students' cognitive styles, it is highly recommended that teaching strategies should embrace combinations of learning strategies and all instructional materails should be prepared to address different cognitive styles.

- 21st century school-aged students are rapid processors of information and demand more expedient methods of instruction and communication, especially when enrolled at HEIs. This should be taken into account when HE programs are developed.

- Students should start to become more actively and flexibly involved in the learning process. Opportunities should be provided for active student involvement.

- Big Data and access to this ever growing amount of knowledge requires additional and new skills for LIS professionals such as diversity of sources, specialization of domains, diversity of consumers of information, technology supported learning is a trend in society. Education programmes in the field of LIS should address these skills. These could be covered in several future summer school programmes.

- How pedagogy, technology and space can be better integrated for a greater impact on teaching and learning should be reconsidered. The majority of classrooms in use today are built for traditional, "stand-and-deliver, sit-and-listen" pedagogies in a passive learning setting. Inflexible layouts and furniture with limited mobility hamper interaction among students, instructors and content. Technology access is often poorly integrated. Instructors and students cannot easily leverage technology to support problem-based pedagogies and hands-on learning. When possible active learning classrooms should be used to create the best possible learning environment to enhance student involvement and learnig.

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