

Making Health Information Accessible for All: The Impact of Universal Design in Public Libraries

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Abstract

On a world basis, 15% of the population has a disability. Having a disability can result in a higher frequency of health-related information needs than other users might experience. The Web represents a widely used source for health information. People with disabilities, however, often encounter barriers during online searching, such as inaccessible information, poorly designed search user interfaces and lack of compatibility with assistive technology. Consequently, many users are potentially excluded from a range of information sources. Measures are therefore needed to remove these barriers to avoid health disparities that can result from unequal access to information. Public libraries have a social responsibility to include all user groups, and should aspire to make fully accessible services. A good tool in this context is the implementation of the universal design mindset, where the purpose is to develop services that are available to all people. This paper discusses how universal design can be a premise for equal access to health information and potentially reduce health disparities in the context of users with disabilities. Both library services and education of librarians will be addressed.

Keywords: Health information seeking, Health disparities, User diversity, Disabilities, Universal design, Libraries

Introduction

It is estimated that approximately 15% of the world population has a disability (WHO, 2011). Many users experience extensive health challenges related to disabilities (Iezzoni, 2011), and might therefore have more frequent health-related information needs than other users. For instance, it has been reported that for people with physical disabilities, the likelihood of seeking health information increases when one's physical function is reduced (Liang, Xue, & Chase, 2011).

The web has become the main information source for most users, particularly for health-related information needs (Jacobs, Amuta, & Jeon, 2017). For many people with disabilities, travelling, way-finding or communication might be challenging. Consequently, digital libraries and online search systems can be suitable alternatives to visiting a physical library. However, online information searching can pose several barriers for people with disabilities, such as poorly designed search user interfaces, inaccessible information and incompatibility with assistive technology (Berget & MacFarlane, 2019). Many users with disabilities are therefore excluded from online health information, which can contribute to health disparities.

Public libraries have an ethical and social responsibility to promote access to information for all users. For instance, according to The Public Libraries Act in Norway, the task of public libraries is *“to promote the spread of information, education and other cultural activities through active dissemination and by making books and other media available for the free use of all the inhabitants of Norway”* (Folkebibliotekloven, 2014). Moreover, *“the public libraries comprise library services to users who have difficulties using the library”* (Folkebibliotekloven, 2014), thus including people who for various reasons cannot visit a physical library. The same responsibility is emphasised in the UN Convention on the Rights of People with Disabilities (UN, 2006), where Article 30-1c ensures the rights of people with disabilities to access libraries. The question is, however, how libraries can fulfil

this social responsibility, and ensure equal access to health and other types of information for all users.

Disabilities are frequently discussed in relation to universal design. According to the universal design mind-set, environments and services should be equally accessible for all people, regardless of functional level (Steinfeld & Maisel, 2012). This perspective is closely related to the idea that a disability does not make a person disabled, but is rather a result of inadequate environments that do not consider the needs of all people. This perspective constitutes the foundation for the first research question:

RQ1: How can the implementation of universal design in public libraries help to make health information accessible for people with disabilities?

While the design of the physical and digital library is important to ensure everyone access to information, there is also a need for well-informed and knowledgeable staff. Librarians may be a valuable resource as intermediaries for patrons who experience challenges during information seeking and searching. However, to provide users with sufficient assistance, librarians need some general knowledge about the impact of disabilities on information seeking behaviour. Librarians should also have a basic understanding of frequently used assistive technologies, such as screen readers and braille displays. Finally, librarians need to know how to communicate sensitively with all types of users. Nevertheless, such topics have not been regarded as a traditional part of the skillset of librarians. The second research question investigates whether educating librarians about universal design may potentially lead to improvements in the accessibility of health information within libraries:

RQ2: How can educating librarians in universal design help to make health information more accessible for people with disabilities?

The paper is structured as follows: The first section summarizes some common barriers experienced by people with disabilities when seeking online health information. The purpose of this section is to provide context for the statement that health information is not always accessible for all users. This is followed by a short introduction to the concept of universal design, including applicability and basic principles. The next section presents some basic principles for implementing universal design in libraries. Finally, the education of librarians is discussed, drawing on input from students enrolled in a library and information science programme who recently completed an elective course in universal design. In this section, the students' thoughts on how knowledge of universal design has affected their view of their own profession will be discussed. The final section contains a more general discussion about how universally designed public libraries and well-educated librarians might play a noteworthy role in providing health information for all.

Background

Barriers to health information access

Universal design deals with reducing barriers. In the context of information seeking, people with disabilities frequently experience barriers when searching for online information. This is a concern, because people with disabilities typically have more health issues than the general population (Iezzoni, 2011) and most health information is now online (Jacobs et al., 2017). Consequently, the use of technology and online health information resources is particularly important, and there is a need for improved search systems to include all users to ensure equal access to health information.

According to Braveman (2014), the purpose behind health equity is to achieve the best possible health for all people. Moreover, to avoid health disparities, it is necessary to direct attention towards user groups who have the highest risks of reduced health, such as people with disabilities. One

requirement for health equity is access to high quality and trustworthy health information (Sium, Giuliani, & Papadakos, 2017).

Digital information sources are now reported to be the most frequently used sources to meet one's health-related information needs (Jacobs et al., 2017). People who are young and have a high digital literacy mostly rely on digital sources. In contrast, older people more often utilize traditional, paper-based sources. It has also been reported that people in general become frustrated when searching for health information, especially for people who use search engines as their primary information source. This finding indicates a need for librarians to train all types of users in information seeking, with a particular focus on quality criteria (LaValley, Kiviniemi, & Gage-Bouchard, 2017), such as the guidelines presented by the Medical Library Association (2020), related to, for instance, the interests of the authors and sponsors and the frequency of updates.

Over the last two decades, many empirical studies have investigated the information seeking behaviour of people with disabilities. Various challenges related to information seeking in general, and searching for online health information in particular, have been identified. Berget and MacFarlane (2019) provide a more detailed review of this research. Regarding certain user groups, there is quite extensive knowledge of the impact of disability on information seeking and searching. For instance, there is a good foundation to build on regarding people with visual impairments and dyslexia. Less is known about the impacts of intellectual impairments, deafness, motor impairments and aphasia (Berget & MacFarlane, 2019).

Previous studies on how disabilities affect information seeking or searching typically focus on different aspects of the search process. Potential barriers a user may encounter vary with disability type. For instance, for people with dyslexia, impaired spelling skills might affect query formulations (Berget & Sandnes, 2015), and result-list assessment may be challenging due to reduced short-term memory capacity (MacFarlane et al., 2010) or impaired reading skills (Fourney, Morris, Ali, & Vonessen, 2018).

For people who are deaf, most barriers arise due to communication challenges and language. Sign language is the primary language of this user group. Written language has a completely different structure and grammar than sign language. Consequently, many people with severe hearing impairments experience reading difficulties (Barca, Pezzulo, Castrataro, Rinaldi, & Caselli, 2013) and might encounter some of the same challenges as people with dyslexia during online search. Another common barrier is inaccessible information due to lack of information in sign language (Barnett, McKee, Smith, & Pearson, 2011; Karras & Rintamaki, 2012; Smith, Massey-Stokes, & Lieberth, 2012) and challenges in communicating with librarians (Jeal, Roper, & Ansell, 1996).

People with impaired vision have been reported to miss out on important information due to inaccessible search user interfaces or compatibility problems with assistive technology (Craven & Brophy, 2003; Sahib, Tombros, & Stockman, 2012, 2014; Xie, Babu, Castillo, & Han, 2018). According to Sahib et al. (2012), people with visual impairments find it challenging to explore search results, and typically take two to three times longer than other users to evaluate results. Andronico, Buzzi, Castillo, and Leporini (2006) looked at search engine interfaces, and identified a need for clearer structure and navigational paths to improve usability for blind people. Another barrier is inaccessible information, for instance pdf-files or image-based content that cannot be accessed by screen readers (Dermody & Majekodunmi, 2011).

In addition to type of disability, there are other factors that should be considered in the context of seeking health information, such as the severity of a disability or illness. For instance, users with physical impairments have been reported to have good source evaluation skills for online health

information (Liang et al., 2011). However, Liang, Xue, and Zhang (2017) found that people might be less rational as their disability becomes more severe. Consequently, for people with more severe disabilities or illnesses, there is a higher risk for health disparities related to lack of access to valid health information.

Based on some of the examples above, there is clearly a need to address information access when discussing health disparities and people with disabilities. Certain key topics stand out, namely deficient search user interfaces, inaccessible information and a lack of compatibility with assistive technology. Several of these issues might be resolved by implementing universal design and following well-established guidelines, such as the Web Content Accessibility Guidelines (W3C, 2018). These guidelines provide a set of recommendations on how to make accessible websites for all users. Examples of such recommendations are to provide text alternatives for non-text content, implement input assistance and ensure that the web site is compatible with assistive technologies. There is also a need for continuing work on studying user behaviour, to better understand how user diversity affects the actual use of search systems and to reveal the specific barriers that must be addressed. Another issue regards potential communication barriers. Consequently, librarians should be trained to communicate sensitively with all types of users. Moreover, they should have basic knowledge of universal design and how this approach can remove barriers in libraries.

Universal design – a measure to remove barriers

Universal design is also referred to as inclusive design or design for all. There are many different definitions of this concept. One commonly applied definition was introduced by Ronald Mace: *“the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design”* (Center for Universal Design, 2008). An important purpose of universal design is that the main solution should be usable by all people, thus removing the need for special adaptations for certain user groups. The overall goal is to simplify the lives of everyone. Universal design is therefore not only addressing disabilities, but also topics such as gender, culture and age. Nevertheless, the concept of universal design is frequently linked to disability only, neglecting the fact that many other user characteristics may cause exclusion, for instance age or cultural background. In this paper, however, the focus will be on disabilities.

According to Story, Mueller, and Mace (1998), universal design is a response to the tradition of designing for *“an average population.”* There is a huge diversity in the human population. Consequently, society must be inclusive of all people, and universal design is one approach to achieve such a goal. The concept of universal design was introduced as a response to demographic changes (Steinfeld & Maisel, 2012). First, there was an increased number of returning war veterans at the end of the 1950s, who laid out the foundation of a barrier-free design movement. Moreover, a longer lifespan has resulted in a higher portion of people that experience limitations due to the way products and environments have been designed.

The universal design mode of thought was criticised early on for being an unachievable, idealistic goal. A set of principles was therefore introduced to provide more tangible support for designers and system developers. These principles (*“The seven principles of universal design”*; see Table 1) were developed at the Center for Universal Design in 1997, with the purpose of developing a measurable standard (Story et al., 1998).

Principle	Definition
1. Equitable use	The design is useful and marketable to people with diverse abilities
2. Flexibility in use	The design accommodates a wide range of individual preferences and abilities
3. Simple and intuitive use	Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level
4. Perceptible information	The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities
5. Tolerance for error	The design minimizes hazards and the adverse consequences of accidental or unintended actions
6. Low physical effort	The design can be used efficiently and comfortably and with a minimum of fatigue
7. Size and approach for use	Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility

Table 1: The seven principles of universal design (Story et al., 1998)

This set of principles is quite general, and does not provide any specific advice on how to fulfil these goals. Each principle has a name, a definition and a subset of 4-5 guidelines (see Table 2 for the complete set of guidelines for principle 4). Although the guidelines are more specific, they are still very general, and potentially difficult to implement directly. Nevertheless, the principles constitute a useful starting point for developing more detailed guidelines for specific products or services, such as library services or web pages.

Guidelines
4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
4b. Provide adequate contrast between essential information and its surroundings.
4c. Maximize "legibility" of essential information.
4d. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

Table 2: The guidelines for principle 4 "Perceptible information" (Story et al., 1998)

Universal design was first conceived as an idealistic concept, with the purpose of reducing inequities in society. However, certain governments have now included universal design in their legislation. Consequently, universal design has become a political measure in several countries to increase accessibility. For instance, the Anti-Discrimination and Accessibility Act in Norway (Lovdata, 2013) states, "As of 1 January 2021, all ICT [information and communications technologies] solutions shall be universally designed." In other words, by 2021, all types of libraries in Norway must provide universally designed digital library services.

Another example is the EU and the directive "on the accessibility of the websites and mobile applications of public sector bodies" (EU, 2016). This directive states that the trends towards a more digitized society requires more accessible websites and mobile applications, including online information. The document refers to the UN Convention on the rights of people with disabilities (UN, 2006) and also universal design as a guiding principle. Moreover, the document states the importance to "promote access for persons with disabilities to new information and communications technologies and systems, including the internet" (EU, 2016)

In the US, the revised version of "Section 508 of the Rehabilitation Act of 1973" requires that ICTs should be accessible to people with disabilities. The law applies the wording "comparable access to publicly available information and services" (Architectural and Transportation Barriers Compliance Board, 2017) and refers to the use of the previously mentioned Web Content Accessibility Guidelines (W3C, 2018). However, the term universal design is not mentioned. The intended impact of these

laws is to improve public services in general, and ICT-solutions in particular, and they apply to all types of libraries.

Universal design has now become both a mind-set and a tool to enhance inclusion in many areas of society. In addition to the Public Libraries Act (Folkebibliotekloven, 2014) mentioned in the introduction, Norway also has a law regarding universities and university colleges (Lovdata, 2005) stating that their libraries should comply with universal design standards. The purpose of this law is to ensure that students have fully accessible learning environments, acknowledging that the library is an important part of their learning environments. Similar legislation should ideally be applied in more countries, ensuring accessible library services and information for all. According to Joint (2005), many libraries have regarded the accessibility issue as *“an extension of the user service ethos of librarianship, rather than as a defensive manoeuvre prompted by a fear of litigation.”* Nevertheless, based on the financial situation for many libraries, especially public libraries, legislation might help to force politicians to allocate enough money to be able to meet the legal demands. Otherwise, it might be difficult to implement universal design in all types of libraries.

Implementing universal design in libraries

The two research questions addressed herein concern two measures to potentially increase access to health information for people with disabilities. RQ1 focuses on the implementation of universal design in public libraries, including both physical and digital library services, while RQ2 concentrates on the potential impacts of educating librarians in universal design. These topics will be addressed in this section.

RQ1: Implementing universal design in libraries

Within a library context, the universal design mind-set calls for public libraries to be accessible for all people, without need for any adaptations or specialized design (Center for Universal Design, 2008). This principle should apply to both physical and digital public library services. The American Library Association (2008) states in their Code of Ethics: *“We provide the highest level of service to all library users through appropriate and usefully organized resources; equitable service policies; equitable access; and accurate, unbiased, and courteous responses to all requests.”* A key topic here is equitable access, which is also the overall goal of universal design. The Code of Ethics by The American Library Association (2008) is also used by libraries outside of the US, and consequently applies to a broad range of countries.

The question is, however, what does it entail to be an accessible library that provides equitable service and access to all users? This topic has been discussed in various contexts. Several guidelines have been put forward related to the web (W3C, 2018), libraries in general (Irvall & Nielsen, 2005) and library materials such as easy-to-read books (Nomura, Nielsen, & Tronbacke, 2010). The International Federation of Library Associations and Institutions (IFLA) has also developed several guidelines targeted towards effectively serving specific user groups, such as people with dementia (Mortensen & Nielsen, 2007), dyslexia (IFLA, 2014) and people who are deaf (IFLA, 2000). The IFLA guidelines contain specific measures that libraries can apply to be more accessible, and contain suggestions and examples of how to improve library services and approach users. A key issue to consider, though, is library services as a whole, including, among others, the physical environments, reference services, the library collection, information literacy training programs, and digital library services (including search systems and web pages). The latter two are especially important in the context of access to online health information for people with disabilities.

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Regarding the physical environment, there is a need for both an inclusive library building and surrounding areas, such as providing accessible parking spaces and an accessible, step-free entrance with wide doors that are easy to open. Such measures will also accommodate people using wheelchairs, pushing trolleys or delivering goods. This is a typical example of how universal design can improve the environment for many types of people, not just users with disabilities. Good lighting conditions are also important to enable deaf people to communicate through lip reading and make it easier for people with impaired vision to navigate. There should also be clear and consistent signage. Further, the library should not rearrange furniture or materials too often, considering users on the autism spectrum who prefer set routines (Akin & MacKinney, 2004) or people with severe visual impairments who have memorized certain navigation routes. In addition, computers and checkout machines should be placed on height-adjustable tables, providing enough space underneath for wheelchair users and allowing patrons to adjust the table to the desired height.

Another important issue is the availability of materials that are accessible and relevant, such as books with large letters, braille alphabet, sign language, talking books and high content / low skills books. Further, an inclusive library should offer materials on topics such as Deaf culture and sign language. In the context of health equity, it is especially important that the library has a good collection of health-related materials, since some users still prefer paper-based materials for health information (Jacobs et al., 2017). Moreover, it is important to provide access to computers that patrons can use to search for online health information, since there are still users with limited access to technology (Jacobs et al., 2017).

It is not realistic that public libraries can provide all types of assistive technology. Such software and devices may be quite costly and local users may have varying needs. However, a basic understanding of assistive technology among librarians would be beneficial. Users may bring their own equipment and require help with activities such as information searching. In that case, it would be helpful to perform the search on the patron's device, enabling the user to utilize assistive technology such as screen readers and consequently be able to assess the results the librarian has retrieved. Moreover, librarians should also have good knowledge of basic accessibility settings in software such as Windows and Mac, to help patrons adjust settings on the library computers, if necessary.

The library catalogue and search systems are important components of the library services. In the context of health information, these are the services that are potentially the most important, since most people now utilize online information sources (Jacobs et al., 2017). Other important issues include information literacy and computer training programmes. Regarding access to health information, users need proficient information literacy. Previous research has reported that many elderly people do not utilize the internet for health information (Jacobs et al., 2017). Therefore, it seems vital to increase information literacy and computer skills in general among this user group, which also often has a high frequency of disabilities of various types, such as reduced hearing or vision.

Information literacy training programmes should be held regularly at the library, adapted to the participants' specific functional levels, cognitive levels, and general needs. This training should comprise both general knowledge about where to find trustworthy health information and how to evaluate health information for validity and trustworthiness. The need for accessible information literacy training for a variety of user groups, including people who are deaf (Jeal et al., 1996), people on the autism spectrum (Akin & MacKinney, 2004) or people who have visual impairments, has been discussed for decades (Dermody & Majekodunmi, 2011).

Reference services are also important, and these should be provided in person, not only digitally. Many people might need help to retrieve online health information, and there should be a low threshold to ask the librarians for help. An issue with health-related information needs and reference questions, however, is that they might contain sensitive information. Consequently, it is especially important that the reference desk is placed so that the user can talk freely to the librarian and that the patron is treated with respect and discretion.

The measures above should not be regarded as an exhaustive list, but rather some examples of steps needed to establish universally designed libraries. Moreover, it is not only the environments that matter, but also the attitudes and skills among the librarians. Incorporating universal design into the education of librarians can help to increase the accessibility of all types of libraries.

RQ2: Educating librarians on universal design

Many papers have been written about how to make libraries accessible, and universal design is often a key topic mentioned. In the context of inclusive libraries, the need for enthusiastic, educated and well-informed staff is often emphasized. For instance, Jeal et al. (1996) discussed how to make library services more accessible for deaf people, and concluded that a central driving force was having enthusiastic and informed staff at the library. Moreover, it was emphasised that librarians' awareness and knowledge are important. Training the staff to understand all types of user needs will consequently enable them to provide higher quality services for all. In a study by Pionke (2020), employees at libraries were surveyed about their attitudes towards accessibility and disability. One of the conclusions were that creating more robust training programmes would probably improve the library services.

Akin and MacKinney (2004) concluded that librarians can make real contributions in the lives of people on the autism spectrum and play instrumental roles in introducing an underserved population to the library. This is in accordance with Neumann (2003), who emphasised that teacher-librarians are uniquely positioned to explore and implement universal design in schools due to their extensive technological skills and understanding of user diversity.

It seems difficult to provide accessible library services without well-educated librarians who understand the diverse needs of their users. Consequently, there is a need to offer courses in universal design as a part of library studies programs. The Department of Archivistics, Library and Information Science at Oslo Metropolitan University provides such an elective course (BIBV 3600: Universal Design). In the subsections below, I first provide a general description of the course and learning outcomes, and then describe some of the students' reflections on how the knowledge they gained from this course may impact their professional lives. The purpose of these reflections is to show some of the potential outcomes of educating librarians in universal design.

Organizing a course for library students in universal design

The course at Oslo Metropolitan University is organized over one semester with two lectures each week. In addition, there is a tour at the Norwegian Library of Talking Books and Braille and a guest lecture by a representative from the organization "Books for Everyone". The introduction to the course, including a general description of the course, its purpose and the main topics addressed, is displayed below, and the learning outcomes are presented in Table 3.

"In Norway there are legal requirements for universal design of among others ICT systems, archives and libraries. The purpose of this course is to understand how different user needs and prerequisites affect the usability of ICT solutions and other services, such as web sites, digital and physical libraries and archives. This course will focus on how universal design may

reduce potential barriers in our society, due to differences in gender, age, cultural background and sensory, motor and cognitive abilities. Topics such as usability testing, legislation, guidelines and accessibility studies will be addressed, and issues such as 'is there a design for all?', 'is it possible to make something accessible for everybody?' will be discussed." (Oslo Metropolitan University, 2019)

Knowledge

After completion of the course, the student has:

- knowledge of universal design and the purpose behind this concept
- an understanding of the difference between universal design and accessibility
- knowledge of user diversity and user needs in relation to the design of ICT solutions in general, and libraries and archives in particular
- knowledge of relevant conventions, legislation and guidelines
- an understanding of usability and user testing

Skills

After completion of the course, the student is able to:

- carry out user analyses, based on different user demographics and contexts
- conduct a selection of accessibility tests
- evaluate whether products and services are universally designed

General competences

After completion of the course, the student:

- is aware of user diversity and potential barriers against equal participation in society
- understands legislation and measures for developing an inclusive society

Table 3: Learning outcomes for BIBV3600 Universal Design (Oslo Metropolitan University, 2019)

For one of the course requirements, students select an empirical paper, for instance a study of how people with visual impairments search for online information. They then present this paper to a small group of their fellow students. The exam for this course is a written assignment the students work on throughout the semester. Each student selects a user group they want to address, for instance people who have a particular type of disability. They then identify the potential barriers encountered by this population when using archives and/or libraries and suggest potential solutions to remove these barriers.

Student reflections

From spring 2018 until autumn 2019, three classes completed this elective course, comprising 94 students in total. During this course, there is often a noteworthy transformation of the classroom discussions, implying a change of awareness and attitudes among the students. Many students show an increased academic interest in universal design and also express a better understanding of how the principles of universal design might contribute to more inclusive library services.

At the end of each semester, all students were given paper-based questionnaires to evaluate the course and reflect upon their learning outcome. This questionnaire included two open questions: a) What was your learning outcome of the course? and b) How do you think this course will affect your professional career or way of working? A total of 48 students answered the survey, resulting in a response rate of 51%. Some of the results are presented in the following sections. Since no personal

data was registered and the forms were handed in anonymously over three semesters, the Norwegian Centre for Research Data deemed this research to be exempt from their review.

On the first question, 83% (n=40) of the students responded that the course had a noteworthy impact on their attitudes and awareness of the barriers to information people may encounter and the consequences of exclusion. Two of the most commonly mentioned outcomes were development of empathy and a better understanding of other people. For example, one student wrote: *"I am more aware of accessibility (...) If something is difficult for me, I start to imagine how it might be for others with disabilities."* Another student described: *"One becomes more aware of how inaccessible the society is, and can be."* Others commented on a similar change of awareness, and mentioned that better knowledge about universal design had affected how they perceive others: *"It has affected the way I see other people, the environment and myself too."*

Although barriers and inaccessible environments were frequently mentioned, many students came away from the course with a more positive view on society and how inclusion is actually an achievable goal: *"I am now aware, more than I was, of the struggles our society has put on people with disabilities. Most of these struggles are unnecessary, and I have also learned how it can be fixed and arguments for fixing it."*

A majority of the students mentioned the importance of including such a course in Library & Information Science (LIS) education. One student said: *"I was positively surprised to see that this course was a part of the library and information science study programme."* Most students thought it should be a compulsory course, rather than an elective course. For instance, one student wrote: *"It [the course] made me aware of many things you should keep in mind to improve your work and its benefits to others. I think it is very important in my work profession to have good knowledge of this subject and I find it irritating that it is not a part of the compulsory study plan."*

A total of 85% (n=41) of the respondents claimed that knowledge of universal design would affect their professional lives. Different perspectives were mentioned, for instance a desire to improve services, changed attitudes towards user groups and an intention to communicate their knowledge of universal design to colleagues. The remaining 15% were unsure, since they did not know what type of job they would end up with after finishing their bachelor's degree.

Much of the LIS literature regarding users with disabilities tends to be accessibility studies, reporting barriers rather than solutions (Berget & MacFarlane, 2019). However, when responding to the survey, most students emphasised the importance of focusing on solutions. For example, one student wrote: *"I think that I will look more upon how to solve universal design issues and less on problems."* This attitude was supported by another student, who wrote: *"This course has opened my eyes for challenges that exist in a library (or any public place) for people with disabilities, challenges I have simply not considered before. This course has made me much more aware of the challenges our users may face, and how we as professionals should go about finding solutions to these challenges."* Another student wrote: *"I see a lot of possibilities that I didn't know about earlier. I would like to work with universal design if possible."*

When discussing the effects of taking the course on their performance in their future profession, a majority of the students made quite general comments, such as: *"I will be thinking more about user groups and how to accommodate them"* and *"I will think more about the needs of all people and help them to be included."* User diversity was mentioned by most students. For example, one student wrote: *"I will be better able to accommodate for all user types."*

Communication with patrons was also frequently discussed. One student wrote: *“I will be more aware of how many different people I might meet in the library, and how their situations and needs differ from my own – I will maybe assume less.”* Other typical statements were: *“I feel that I am more prepared to be able to be a better librarian for a higher number of users”* and *“I think I will be able to use much of what I have learned. Just to talk to patrons has become much easier. I think I can be a good librarian.”*

While most students gave quite general statements about their profession, some students provided very specific examples of how their knowledge in this domain would probably affect their work activities. One example was considering user diversity when making exhibitions: *“I think I will consider that measures which might be purposeful for one user group may provide great negative consequences for other users, and that it is important that for instance exhibitions works for everyone, and does not only look nice.”* Another mentioned the potential problems with frequent rearrangements of libraries: *“Makes me think one more time before rearranging the library I am working in. That might be negative for many large user groups.”* Others emphasized a responsibility to communicate their acquired knowledge to other librarians, such as: *“I perceive it as a task to affect the attitudes and awareness of my future colleagues.”*

Discussion

According to Braveman (2014), people with disabilities are among the user groups with the highest potential risk of poorer health. Moreover, research on information seeking behaviour has revealed a range of barriers that reduce access to online health information for many people with disabilities (Berget & MacFarlane, 2019; Hill, 2013). Access to trustworthy and high quality health information is a requirement for health equity (Sium et al., 2017). Therefore, public libraries have an important responsibility to ensure equal access for all users, in particular people who frequently experience barriers to accessing relevant health information.

The first research question addressed herein focused on how the implementation of universal design in public libraries can help to make health information accessible for people with disabilities. Public libraries have great potential to remove barriers to health information, and furthermore, to contribute to health equities. It seems likely that there is a great potential in implementing the universal design mind-set to achieve equal access to information for people with disabilities.

There are mainly four areas that should be addressed to counteract health disparities in a public library setting: offering universally designed library environments, providing accessible information (e.g. by making portals or collecting trustworthy sources in one, accessible web page), offering inclusive information literacy training, and assisting users with retrieving trustworthy health information.

Several barriers that people with disabilities encounter during information seeking could be reduced or removed by applying the seven principles of universal design (Story et al., 1998) to both physical and digital library services. The seven principles (Table 1) comprise helpful guidelines to making information more accessible for all users. The first four principles are especially important in the context of online information, namely equitable use, flexibility in use, simple and intuitive use and perceptible information. These principles comprise key topics, such as designing for diverse abilities and for variations in user experience, knowledge, language, concentration and sensory abilities. In combination with these principles, WCAG (W3C, 2018) and the various IFLA guidelines (IFLA, 2000, 2014; Irvall & Nielsen, 2005; Mortensen & Nielsen, 2007; Nomura et al., 2010) provide useful advice on how to make libraries more inclusive and provide more users with access to health information. LaValley et al. (2017) reported a particular need for information literacy training in the context of

health information. However, for such courses to be truly useful for everyone, they must also follow the principles of universal design, ensuring that they are accessible for everyone (Akin & MacKinney, 2004; Dermody & Majekodunmi, 2011; Jeal et al., 1996).

The second research question addressed how educating librarians in universal design can help to make health information accessible for people with disabilities. Educating future librarians in universal design can make inclusion a natural part of their mode of thought in their work lives, rather than something they merely view as a compulsory legislative requirement (Joint, 2005), which aligns well with the universal design mind-set.

My experiences from teaching a course in universal design are very positive. The students become very interested in user diversity and showed increased empathy and reflections regarding people with disabilities. The reflections from the students presented in this paper indicate that such a course may change their ways of thinking about library services and about communicating with people with disabilities in their professional lives. This feedback from the students also indicates that it would likely be beneficial to include similar courses in other library and information science study programmes. Previous research has also shown that successful library services often rely on enthusiastic and educated librarians (Akin & MacKinney, 2004; Jeal et al., 1996; Neumann, 2003) and has suggested a need for training programmes on disability and accessibility (Pionke, 2020). Consequently, an overall goal of LIS education should be to ensure that all future librarians are both knowledgeable and aware of the importance of universal design. Courses such as BIBV3600 might be a good measure to achieve that.

Conclusion

Inaccessible health information represents a barrier to health equity. Public libraries and librarians have the opportunity to reduce this gap by providing inclusive services and offering accessible health information. There seems to be a great potential in implementing universal design, not only in public libraries but also other types of libraries, such as hospital libraries or university libraries. Legal demands for accessible services might be purposeful, since they might ensure that measures are taken to include people with disabilities. Since laws typically only contains a demand for accessibility rather than suggesting how to achieve inclusive services, there is a need for a greater understanding of how to make inclusive library services actually inclusive. This applies both to decision makers and practitioners.

Libraries serve as important democratic institutions with a social responsibility to include all inhabitants. However, librarians need the tools to know how to make their library both an inclusive meeting place and an accessible information provider. Findings from the survey of students in a universal design class suggest that attitudes and awareness are important, and that these type of courses might affect the professional lives of the library students. More library and information science study programmes should therefore incorporate universal design courses into their educational programmes.

Knowledge about user diversity and how to best support and communicate with all patrons, including people with disabilities, is important, and should be regarded as core knowledge in this profession. We also need additional research to identify the specific skills librarians need to have in order to be able to ensure the accessibility of their library's space, resources, and services for all of their patrons. Other possible areas of future research would be to investigate some specific ways in which universal design might be applied within public libraries, as well as assessing the impacts of these various strategies.

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