Determinants of digital inclusion in students with visual impairment in tertiary education

(scientific paper)

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Abstract: *The aim of the paper is to describe the selected determinants of digital inclusion in students with visual impairment in tertiary education. The research sample consisted of 54 students – respondents diagnosed with low vision, residual vision, practical and complete blindness from the Czech and Slovak Republic. By using mathematical and statistical methods, we have found that the visually impaired students evaluate the accessibility of electronic study materials in the first year of their university studies as worse compared to the visually impaired students in higher years. At the same time, by applying the Pearson product-moment correlation coefficient, we confirmed that there is a significant relation between the satisfaction of visually impaired students with the services of support centres at public universities and their expression of satisfaction with accessibility of electronic study materials.*

Keywords: *digital inclusion; student with visual impairment; tertiary education.*

1 Introduction

The concept of inclusion first appeared in the 1990's in Europe, in the context of the *Salamance Statement's* education policy. Following the world conference in Salamanca, organized in 1994 by UNESCO and the Spanish government on the topic of *Special Needs Education,* with the goal "***Education for All***," the governments of 92 countries signed the resolution setting as their goal to achieve a fundamental political change towards inclusive education (Salamanca Statement UNESCO, 1994).

Unlike integration, inclusive education perceived this way no longer focuses on the educational issues of individual pupils or students or on the range of differences, but rather on the society, the group, the structure of the system where the educational

conditions and participation in the inputs into the heterogeneous study group should be organized jointly (Booth, Ainscow, 2007).

Development in the field of access to education in relation to human diversity is determined in summary by Scholz (in Svoboda, 2013) in the following five stages:

- **Isolation (exclusion)**, when a certain group of persons is fully excluded from the educational process based on the determined educational or social criteria;
- **Segregation (separation)**, in which a selective approach is applied to classification of persons with certain disadvantages into individual groups that are educated in special schools, segregated from the education mainstream;
- **Integration** providing the persons with a disadvantage an opportunity to be educated at a mainstream school based on fulfilment of determined criteria and with adequate support provided, aimed at adapting to the majority and at achieving the same results;
- **Inclusion** respecting the individuality of all persons by creating an educational environment that includes all people into society according to the same principle, taking into account the particularities of each individual;
- **Automatic inclusion**, which represents an ideal stage where the diversity of everyone is taken as a matter of course, as a normal and natural part of the society.

Therefore, the shift from integration to inclusion is not only a shift in terminology created in order to achieve political correctness, but also a fundamental change in the view of the issue. Under the conditions of universities and colleges, this represents the shift from the adoption of the standpoint that the obstacles are on the student's part, to adoption of the so-called *social model*, where the study barriers are inherent in the school structures themselves and in the standpoints of the society in general.

Differences in the comparison of integration and inclusion concepts in tertiary education are provided in Table 1.

Table 1: Differences between integration and inclusion in tertiary education

	Integration	**Inclusion**
Target group	– Pupils and students with special needs	– All pupils and students
Emphasis on	– Specific needs of pupils and students; – Special educational programs and approach;	– Individual needs of all pupils and students; – Individual educational approach
Position of the pupil and student	– Pupil/student adapts to the majority	– Each pupil/student is accepted as an individuality

Teaching strategies	– Special teaching strategies usable exclusively for pupils and students with special needs	– Special teaching strategies involving techniques usable for all pupils and students
Impact of environment	– Pupil/student adapts to the environment – Partial adjustments to the environment (so-called accessible designing)	– Flexible and adaptable environment; – Overall change to the environment (so-called universal environment)

According to Čerešňová and Rollová (2015), inclusive education is focused on the application of human-centric approaches, where human beings and their values are the centre of the interest and are fully respected. Its main goal is to provide for the current needs of all persons participating in the educational process and at the same time to create inclusive environment in the minds of people as a great guiding principle for the development and future of the inclusive society.

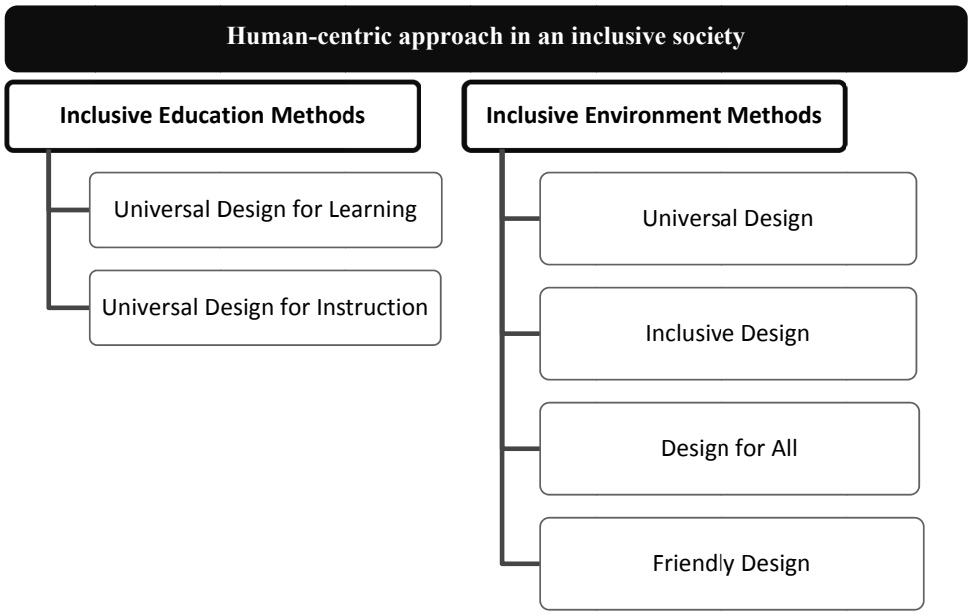

Figure 1: Application of human-centric approaches in an inclusive society (Čerešňová, Rollová, 2015, p. 13)

The so-called tertiary level educational process is one of the most complex processes in the teaching practice in general. High demands on the teaching quality

is reflected reciprocally in the level of demands placed by the university teachers on the students' learning performances.

Recently, the Czech and Slovak Republic claim to adhere to the European university education standard, the obligations of which include the provision and mediation of equal involvement of specific needs of students into the university education.

Unlike the lower education levels, there are no "special" universities or colleges in the Czech and Slovak Republic, intended for and fully adjusted to educating students with special needs. Thus, the study usually takes place in form of individual or group integration. As mentioned by Vitásková et al. (2003), improvement of the university education for students with special needs is an integral part of the demanding long-term inclusion process, which, if successful should be concluded by the professional and social inclusion.

2 Visually impaired student in tertiary education

According to Slovak legislation (Act No. 131/2002 Coll., as amended, and Methodology for the Breakdown of Subsidies from the State Budget to Public Universities and Colleges for 2016 No.: 2015-23797/65260-3: 15A0), a student with special needs is an individual meeting at least one of the criteria from the classification system (Table 2).

Table 2: Classification of students with special needs at universities and colleges in the SR

A1	**1 – Sightless student** **2 – Partially sighted student**
B2	3 – Deaf student 4 – Hard of hearing student
C1	5 – Student with disability of lower limbs
C2	6 – Student with disability of upper limbs
D	10 – Student with autism or other pervasive developmental disorders 11 – Student with learning disabilities
E	7 – Student with chronic disease 8 – Student with impaired health 9 – Student with mental illness

In a similar way (Table 4), individual categories are determined in the Czech Republic (Rules for Providing Contributions and Subsidies to Public Universities and Colleges of the Ministry of Education CR).

Table 3: Classification of students with special needs at universities and colleges in the CR

A	**Student with visual impairment:** **A1 – Partial visual impairment/using sight** **A2 – Severe visual impairment/using touch/voice**
B	Student with hearing impairment: B1 – Hard of hearing/using spoken language B2 – Deaf/using sign language
C	Student with physical disability: C1 – Disability of lower limbs (paraplegia) C2 – Disability of upper limbs (fine motor skills)
D	Student with specific learning disability
E	Student with autistic spectrum disorder
F	Student with other difficulties (mental disorder or illness, non-autistic developmental disorders, impaired communication skills, chronic somatic disease)

While it may seem at first sight that the aforementioned classifications strictly respect the medical view, the opposite is true. The medical viewpoint may be taken into account in this classification, however, as the input information only. The so-called ***functional principle***, which represents a practical impact of the particular diagnosis on the working, educational or communication approaches and procedures chosen during the university studies, is much more important.

The primary purpose of the approaches and procedures chosen this way is to enable a correct graduation in the field of study and achievement of needed study, work or research results.

Lowenfeld (in Květoňová, 2007) specifies three basic restrictions caused by visual impairment:

1. **Limitation of the scope and diversity of experience** – severely visually impaired individuals are exposed to information deficit for a lifetime. This long-term deficit in meeting the need of visual stimuli may cause sensorimotor deprivation at the mental level;
2. **Limitation of mobility** – the person with more severe visual impairment has two options – either learning to cope with maximum dependence on a guide or starting to become independent through mobility training;
3. **Reduction of control of environment and oneself in the environment.** This last restriction is of social nature, expressing in the interpersonal relationships primarily.

As Litvak (1979) aptly points out, the sensoric disorder does not have to influence the whole development of personality and does not have to change and transform it radically. Požár (1997) states that the stable components of personality such as focus, abilities, temperament and nature, are only related to the visual impairment indirectly, or some of the features may express in a certain way due to the approach to the person or their impairment itself. In some of the cases, this relation is conditioned by deficiencies in the field of insufficient sensory learning and negative experience in the field of cognitive and orientation activities (e.g. fear of anything new, inappropriate parenting methods, long-term stay in a larger group of people other than family and last but not least, unsatisfactory experience in the effort to make contact with sighted persons). In this context, Květoňová (2007) states that under normal upbringing and education approach and corresponding social interaction, the core of personality should develop without any variations. Therefore, the impairment of visual functions is not an ultimate obstacle to building or developing a full-valued personality.

Tertiary education of visually impaired students not only assumes but also necessitates the creation of suitable conditions considering their special needs. Minimization of the particular restrictions may be ensured by using the special compensating aids, adjusting the work environment, by erudition of teachers, adequacy of the work forms and methods. Teacher should be informed about the student's visual condition and about the nature of their impairment (sight functionality and possible use), about the impact of their visual condition on the visual functionality (sensitivity to light, colour recognition, font size), about the student's visual acuity; about the use of special equipment and compensating aids (dictating machine, computer, Braille writing equipment), about the procedures available to the student in their work (note recording system, entitlement for assistance), about the need to extend the time for work, about the need to verbalize their actions, about the preparation and adaptation of materials, etc. (Lopúchová, 2007).

From the position of a visually impaired student admitted to university studies, the following may appear as challenging:

- **Spatial orientation** (orientation in the university or college building/buildings, mobility in the university building or student halls of residence, in the canteen, in the library, etc.). The support measures to enable spatial orientation and mobility may include the aid of an assistant (at least for a certain period), navigation system in the building, maps on individual floors, etc.;
- **Getting to know the teachers and fellow students.** Possible difficulties in social contact resulting mostly from the unfamiliarity of the principles of social contact

with a visually impaired on the part of intact persons. The possible solution is to raise awareness of the rules of social contact (Květoňová, 2007).

The information deficit has its pitfalls in the access to information, which does not cause any issues to sighted persons (notice boards, door labels, sheets with consultation hours, dates of credit tests and exams, etc.). There is a solution available for these situations – publishing information on the websites; descriptions on doors and rooms in Braille. However, the difficulties concerning the availability of study literature and other visual information are more serious. The possible solution here is to digitalise the texts, which is being implemented by several specialized workplaces at universities and colleges. In addition, the content of lectures, references to graphs and images and the exams themselves are challenging. For lectures or workshops, we recommend borrowing the presentation in electronic form to the student; for exams, the text can be prepared in digital form. Verbal exams are usually not an issue.

The main institutions making effort to improve the aforementioned conditions include the **support centres**, which currently operate at several Slovak and Czech universities and colleges. Thanks to these centres, an increasing number of students with special needs can study at universities and colleges every year.

3 Research Background

The aim of the research is to describe the selected determinants of digital inclusion in students with visual impairment in tertiary education. We focused on the specifics in the field of subjective perception of electronic accessibility of the university environment in individual years of study. In order to clarify the purpose of support centres in the field of digital inclusion, we analysed possible significant mutual correlations concerning the student satisfaction with the services and the level of their satisfaction with the availability of study materials. Separately, from the visually impaired student's point of view, we monitored the differences regarding accessibility of university websites and electronic study administration systems.

Research sample

The research sample consisted of 54 respondents (students) with different degree and type of visual impairment, studying at universities and colleges in the Czech and Slovak Republic. The broader classification of respondents was differentiated (in compliance with the 10th review of the WHO classification) in the categories as follows:

1. Medium low vision (visual acuity 3/10–1/10);
2. Strong low vision (visual acuity 1/10–1/20);

3. Severe low vision/practical blindness (visual acuity 1/20–1/50 or bilateral concentric visual field constriction under 20 degrees, or monolateral constriction of the only functional eye under 45 degrees);
4. Practical blindness (visual acuity 1/50 – light perception);
5. Full blindness (no light perception).

For the purposes of mathematic and statistical data processing and interpretation of results, we used the following basic three-stage classification taking over the selected categories also from the special education terminology:

- Practical or full blindness;
- Residual vision;
- Low vision.

Table 4 below provides distribution of the research sample by the basic three-degree classification.

Table 4: Distribution of respondents – students by the degree of their visual impairment

Degree of visual impairment	Number of respondents (n)	Relative number (in %)
Practical/full blindness	18	33
Residual vision	21	39
Low vision	15	28
Total	**54**	**100**

Apart from the degree of visual impairment, we examined the preferences of respondents for using their senses when working with electronic information. We found that, apart from auditory perception, 13% of the respondents use the sense of touch exclusively and an additional 20% mentioned the sense of touch as one of the primary senses and sight as the secondary sense in using the assistive technologies.

The number of visually impaired students participating in the research study from the Slovak Republic was 14.8% lower compared to students from the Czech Republic.

Table 5: Distribution of respondents by countries (n = 54)

Country	Number of respondents (n)	Relative number (in %)
Czech Republic	31	57.4
Slovak Republic	23	42.6
Total	**54**	**100**

In terms of gender, we recorded a higher number of male respondents. When comparing the relative number, this difference amounted to 26%.

Table 6: Distribution of respondents by gender (n = 54)

Gender	Number of respondents (n)	Relative number (in %)
Female	20	37.0
Male	34	63.0
Total	**54**	**100**

Research methods

For the purpose of identification of other specific aspects of e-Accessibility as well as the selected digital barriers from the position of visually impaired respondent (student), we used the questionnaire method. Replies from the respondents were obtained by a questionnaire, as a written method of asking questions and receiving written answers (Gavora, 2008).

For the research purposes, the questionnaire was created in several accessible electronic formats. When replying to the questions, the respondents could select the questionnaire in the form of online web form or text document in RTF, ODT or DOC formats. In order to ensure higher return rate of the distributed questionnaires, we cooperated not only with the universities themselves but also with workers and associates of non-government non-profit organizations (Slovak Blind and Partially Sighted Union, Training School for Guide Dogs, Tyflocentrum), providing consulting and other specialized services for individuals with visual impairment in the Czech and Slovak Republic.

Research hypotheses

During our research, we established the following 3 research hypotheses.

H1 Students with visual impairment in their first year evaluate the accessibility of electronic study materials at university worse than the students in higher years.

Operationalized statistic hypotheses to the research hypothesis 1:

- H0 There is no statistically significant difference in the subjective evaluation of accessibility of electronic study materials between the visually impaired students in their first year of study and in the higher years.
- HA There is a statistically significant difference in the subjective evaluation of accessibility of electronic study materials between the visually impaired students in their first year of study and in the higher years.

H2 There is a significant relation between the satisfaction of visually impaired students with the services of support centres at public universities and their expression of satisfaction with accessibility of electronic study materials.
Operationalized statistic hypotheses to the research hypothesis 2:

- H0 At the level of significance 0.01, there is no significant correlation between the satisfaction of visually impaired students with the services of support centres at public universities and their expression of satisfaction with accessibility of electronic study materials.
- HA At the level of significance 0.01, there is a significant correlation between the satisfaction of visually impaired students with the services of support centres at public universities and their expression of satisfaction with accessibility of electronic study materials.

H3 The subjective satisfaction rate of visually impaired students is significantly higher regarding the accessibility of the university website compared to the electronic study administration system.
Operationalized statistic hypotheses to the research hypothesis 3:

- H0 There is no statistically significant difference in the subjective satisfaction rate of visually impaired students with the accessibility of the university website compared to the electronic study administration system.
- HA There is a statistically significant difference in the subjective satisfaction rate of visually impaired students with the accessibility of the university website compared to the electronic study administration system.

4 Results

Hypothesis 1 test results.
Students with visual impairment in their first year evaluate the accessibility of electronic study materials at university worse than the students in higher years.

Based on the comparison of relative numbers, we may state that the subjective satisfaction rate of visually impaired students with e-Accessibility of electronic study materials increases with the increasing year of study at university or college.

These results do not have to prove automatically an improving level of e-Accessibility of the university study materials. The result may be explained by an improving ability in the field of utilising the assistive technologies and the increase of skills of the students in higher years to overcome digital barriers. This opens a question related to the task of support centres at universities and colleges regarding the cooperation with visually impaired students in overcoming the said digital barriers.

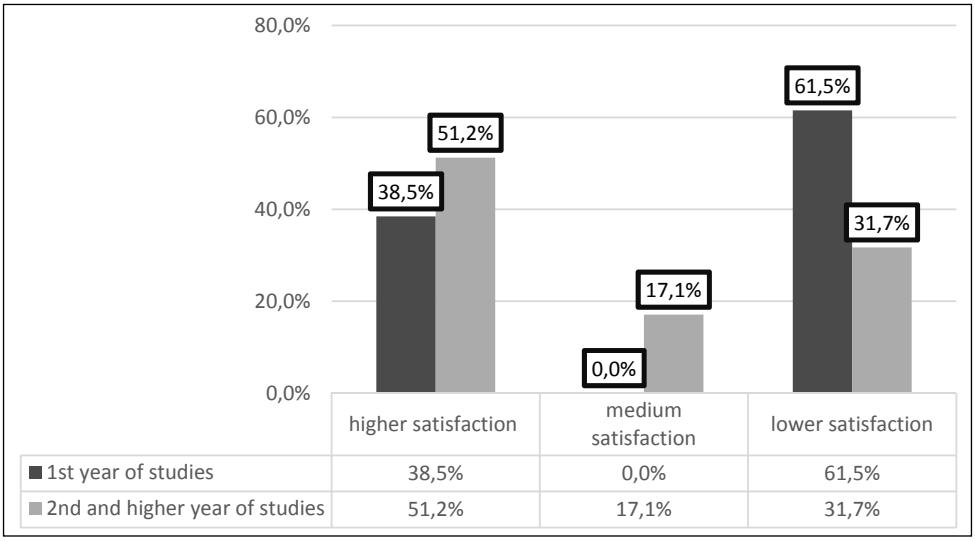

Figure 2: Comparison of the relative numbers regarding satisfaction with the accessibility of electronic study materials in the 1st year and the higher years of study

When comparing individual results between the 1st year and the higher years of study, $\chi 2$ (after Yates' correction) achieved the value of 4.812, which is lower than the critical value (5.991) at the significance level of 0.05 (2 degrees of freedom). Therefore, we reject the alternative hypothesis and accept the null hypothesis.

Conclusion: Students with visual impairment in their first year **do not evaluate the accessibility of university electronic information worse** than the students in higher years.

Hypothesis 2 test results.
There is a significant relation between the satisfaction of visually impaired students with the services of support centres at public universities and their expression of satisfaction with accessibility of electronic study materials.

The rate of closeness of the relation between the variables was evaluated by using the *Pearson Correlation Coefficient* (Figure 3).

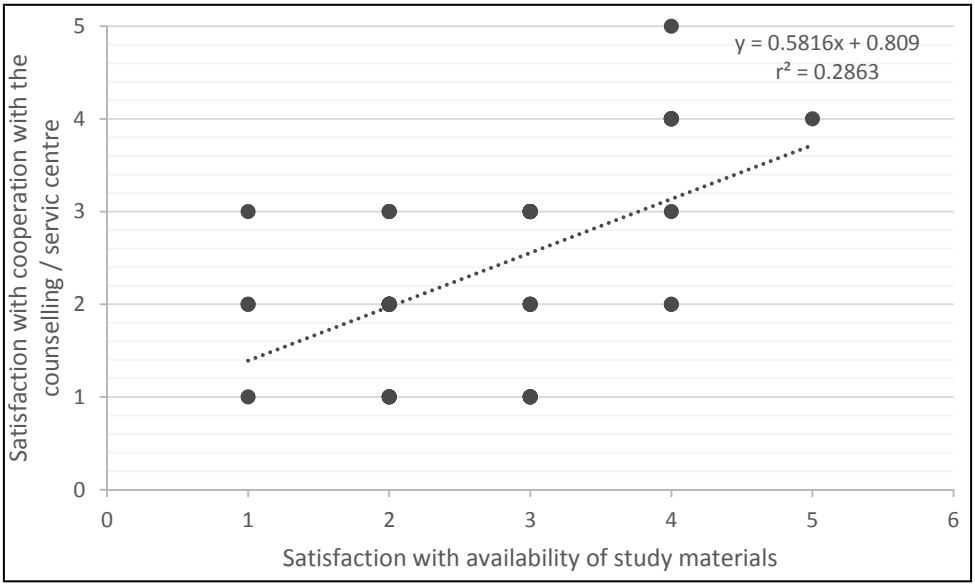

Figure 3: Illustration of the correlation between individual rates of satisfaction of visually impaired students at the public universities and colleges in the CR and SR

The correlation analysis results in the correlation coefficient of (r) 0.535. Compared to the table value rk = 0.361 (at the significance level of α = 0.01), the calculated correlation coefficient value (r) is higher. Therefore, we reject the H0 and accept HA.

Conclusion: There is a **significant relation** between the satisfaction of visually impaired students with the services of support centres at public universities and their expression of satisfaction with accessibility of electronic study materials.

Hypothesis 3 test results.
The subjective satisfaction rate of visually impaired students is significantly higher regarding the accessibility of the university website compared to the electronic study administration system.

Based on comparison of the relative numbers, we may state that the highest discrepancy rate between the variables was evaluated at the higher satisfaction level.

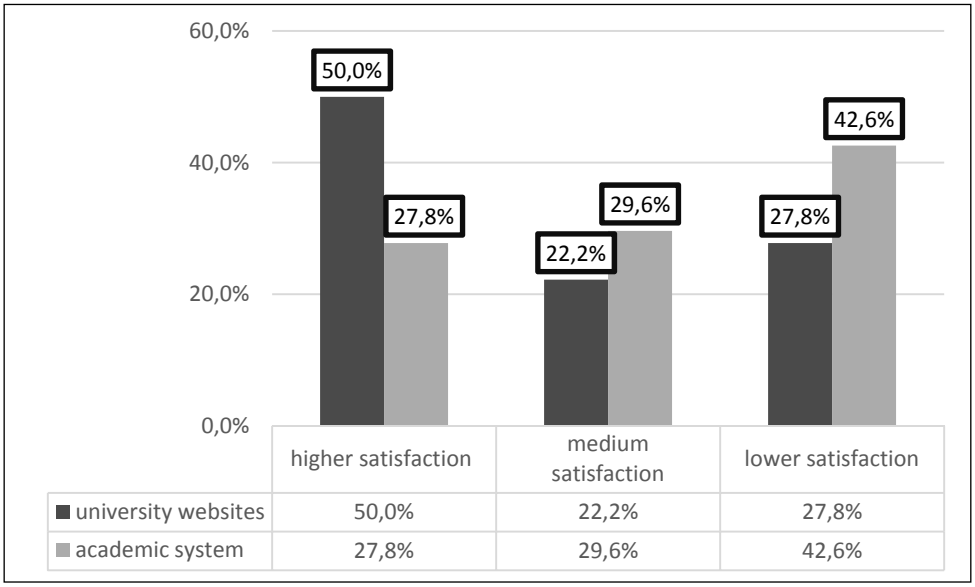

Figure 4: Comparison of relative numbers in the satisfaction level among visually impaired students with accessibility of the university websites and the electronic study administration systems

Based on the results, $\chi 2$ (after Yates' correction) achieved the value of 5.684 (Annex 13), which is lower than the critical value (5.991) at the significance level of 0.05 (2 degrees of freedom). Therefore, we reject the alternative hypothesis and accept the null hypothesis.

Conclusion: The subjective satisfaction rate of visually impaired students **is not significantly higher** regarding the accessibility of the university website compared to the electronic study administration system.

5 Discussion

Based on our findings, we may conclude that the academic workplaces providing support to students with special needs have a high potential in solving the issues of digital inclusion in tertiary education. In this context, the practical issue is to ensure the specialized services across all the universities and colleges in compliance with the strictly defined quality standards.

The process of elimination of the digital barriers impact is limited by the fact that the specialized support and counselling centres for persons with specific needs are not operating at all universities and colleges in the Czech and Slovak Republic. Therefore, we definitely recommend every university and college to actively cooperate

with an expert on information technology accessibility. Several extended electronic systems (e.g. IS Stag/Portal; Moggis, MAIS, AiS2, ISKaM; WebKredit) contain digital barriers preventing the visually impaired students from participating fully in tertiary education.

The experience from abroad clearly proves that there is no exact boundary between *"admissible"* and *"inadmissible"* fields of study for an individual with severe visual impairment. In this context, the story of a blind student (Cordes, 2010), who earned his Doctor of Medicine degree (abbreviation MD) at University of Wisconsin School of Medicine and Public Health represents a very positive example. Subsequently, he also earned the academic title, PhD. This example is a great challenge as well as acknowledgement that the inclusion of persons with health disability cannot be limited to rigid schemes determining which academic fields are permissible and acceptable for individuals with severe visual impairment.

6 Conclusion

Electronic accessibility affects the level of involvement of the visually impaired students in digital processes in tertiary education. The rapid and massive development of electronic processes (such as the academic information systems, digital catering and accommodation information systems, electronic educational and teaching systems, etc.) have brought potential benefits for the inclusion of visually impaired students within tertiary education. In this context, the **electronic platform** itself, having a high potential to meet the requirements of severely visually impaired students, is the key determinant. (Regec, 2015; Regec 2016)

It is not desirable for the universities and colleges to perceive the requirement for accessible electronic environment for visually impaired individuals as unfounded or *"illegitimate"*. Another widespread practice is the differentiation of the fields of study based on suitability, *acceptability* or *unsuitability* (*inacceptability*) for visually impaired individuals. As a result, the initiatives aimed at providing accessible electronic content in compliance with the requirements of severely visually impaired individuals (residual vision, practical or complete blindness) are being described as irrelevant. We consider the legitimisation and approval of digital barriers due to the focus of the field of study, assuming it to be unsuitable for visually impaired students in advance, as incorrect and contradictory to the inclusion policy.

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