

# Where are the Students? A Study of Norwegian Technology Students' Perceptions of Emerging Trends in Higher Education

Frode Eika Sandnes<sup>1,2</sup>[0000-0001-7781-748X]

<sup>1</sup> Oslo Metropolitan University, N-0130 Oslo, Norway

<sup>2</sup> Kristiania University College, N-0153 Oslo, Norway  
frodes@oslomet.no

**Abstract.** Teachers in higher education in Norway have over the last decade reported reduced physical attendance in lectures, students not using the textbooks, and low academic performance. Also, there is an intensified institutional pressure to make use of digital tools and flipped classroom paradigms. To obtain better insight into students' perceptions of these issues a class of computer science students' perceptions were probed using a comprehensive questionnaire. The results confirm some of the claims that students want more digital learning such as videos, but perhaps not as black and white as it is often presented. Implications of the results is that one should not simply follow a single approach but employ an array of varied learning activities and materials.

**Keywords:** student perceptions, learning activities, student preferences, active learning, textbook, reading skill, writing skill, variation.

## 1 Introduction

There are several key issues that emerged in higher education over the last decade and some claim that higher education is undergoing a major transformation. One of the widely discussed topics is that of distance education [1, 2] and digital education [3] where students can engage in learning activities across time and place. Issues such as MOOCs (Massive Open Online Courses) have received much attention [4]. More specifically, the use of streamed lectures and recorded lectures is a topic that is much discussed [5].

Another issue is to rely on the classical textbook versus emerging media [6]. Textbooks are often quality assured, and they are either purchased or borrowed. Traditionally, textbooks were only on printed paper but are increasingly being offered in electronic format [7]. However, the traditional textbook regime is being challenged by open and freely available online resources. Such resources take on many forms from freely available books, articles, blogs, discussion forums and videos.

Third, the student and teacher populations are becoming increasingly diverse [8, 9]. Student diversity evolves around multiple dimensions such as motivation and aspiration [10], background, and experience as well as socioeconomic and cultural backgrounds.

The needs of such student populations are also diverse. The need for individual follow-up seems more important than ever.

Yet, as reported by many educators, auditoriums rapidly become sparse as the semester starts, students report not acquiring the textbooks, students do not contact the teachers – at least the students who should be contacting the teacher. The motivation of this study was therefore to obtain insight into students' perception of key questions related to current pedagogical issues. Our previous studies of student perceptions have been used to probe a range of issues including plagiarism [11], university life [12], internationalization and cultural differences [13], choice of university [14], learning tools [15], to mention a few. It was decided to focus this study on the use of the classic textbook, students' future plans, and students prior experience including prior higher education studies and work experience. Pedagogical issues addressed included the use of video or streaming versus traditional lectures, group versus individual learning, exams versus portfolio examinations, and so forth. Issues related to learning management systems [16] and digital organization of learning materials [17] were not addressed in this study.

## **2 Method**

### **2.1 Experimental design**

A questionnaire-based study was chosen with mostly closed questions. Some questions were designed to allow for between group analyses, in particular for dividing students along the lines of those who have acquired the textbook, who had previous higher education experience (previous degree), previous work experience and future study plans.

### **2.2 Context**

The questionnaire was employed in an undergraduate course of Human Computer Interaction where the students are taught a curriculum covered according to a traditional textbook [18]. This course is predominantly lecture-based but lectures are voluntary. The focus is on active learning through work on three projects, in which two are group works and one is individual work. One of these group projects involves design thinking which is intended to show train the students to get value from collaborating in teams [19]. The second group project involves a controlled empirical experiment [20, 21, 22]. The course is assessed based on a portfolio comprising three reports resulting from the three practical projects. Students get formative feedback on the projects and could submit a revised portfolio for assessment. The teacher was available for consultation and supervision throughout the semester.

### **2.3 Participants**

Approximately 150 students were initially taking the course. The total number is approximate as some students sign up late and some students drop off and there is therefore no well-defined total number. A total of 42 students responded to the questionnaire yielding an approximate response rate of 28%. The questionnaire was anonymous and no information about demographic details were collected.

### **2.4 Materials**

A comprehensive questionnaire with 58 questions were designed. Most of the questions were closed with 46 5-item Likert scale questions, 4 yes/no questions and 8 open free-text questions. The questionnaire addressed students' attitudes towards textbooks, streaming and video, details of the curriculum and usefulness and relevance. The questionnaire was implemented using Google forms.

### **2.5 Procedure**

The questionnaire was distributed electronically during two weeks of October 2019 as part of the midterm course evaluation. This approach was chosen to prevent introducing an additional questionnaire but instead integrate the additional research-oriented questions as part of the regular obligatory course evaluation questionnaire to prevent evaluation fatigue. The questionnaire was totally anonymous and voluntary. The results were later presented and discussed in class and used as a case for statistical analysis and hence incorporated as part of the curriculum.

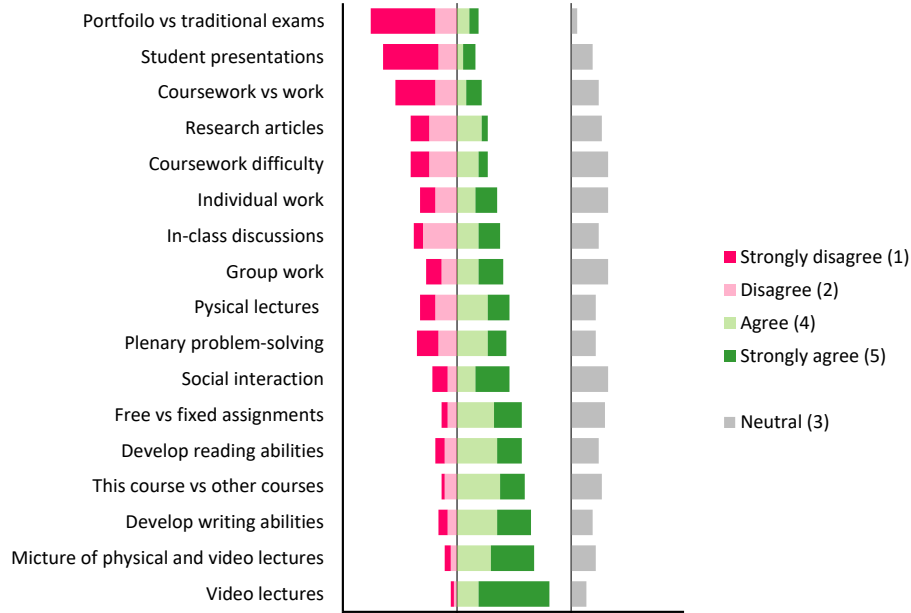
### **2.6 Analysis**

The results of the questionnaire were analyzed using the statistical software JASP version 0.11.0.0 [23]. Non-parametric statistical tests (mostly Mann-Whitney U tests) were used as the Likert responses were ordinal. Only the questions related to the research questions are discussed herein. The questions related to the general course evaluation are not discussed herein.

## **3 Results**

### **3.1 General results**

Fig. 1 shows general responses to the questions. On the two extreme ends of the scale the results indicate that students were very much in favor of portfolio evaluation over traditional exams and video lectures – these items also have also few neutral responses. On the lower end of the scale, students were not in favor of student presentations in class. Students appears to have prioritized coursework over part-time jobs.



**Fig. 1.** Distribution of overall responses illustrated as a diverging stacked bar chart with issues sorted according to their responses falling on the left to the right side of the scale. Magenta responses (left) indicate the lower end of the Likert scales (1 and 2), and green responses (middle) indicate the higher end of the Likert scales (4 and 5). Grey (right) indicates neutral responses (3).

On the higher end of the scale students prefer a mixture of physical and video lectures, value developing writing abilities, students tend to prioritize other courses over the current course, value developing reading abilities, prefer fixed assignments over free assignments and value social interaction.

The responses to the remaining questions appear balanced on the scale and appear neutral, that is regarding students' opinions about the incorporation about research articles, individual work, in-class discussions, group work, physical lectures and plenary problem solving.

### 3.2 Effect of textbook

Of the responses 21 had acquired the course textbook and 16 had not. When separating the responses according to the students who have acquired the textbook several interesting differences were observed among the two groups. First, there was a significant difference in how the two groups valued the importance of developing ones writing abilities ( $W = 235.0, p = .034$ ). Those who had preferred the textbook had ranked the importance of developing writing abilities higher ( $M = 4.1, SD = 0.8$ ) than those who had not acquired the textbook ( $M = 3.1, SD = 1.5$ ). There was also a significant difference in the desire to have more scientific research articles in the curriculum ( $W = 75.0, p = .013$ ). Those who had not acquired the textbook exhibited more positive responses towards

more academic articles ( $M = 3.4$ ,  $SD = 1.2$ ) than the students who had acquired the textbook ( $M = 2.3$ ,  $SD = 1.0$ ).

There was also a significant difference between the two groups in terms of how easy they found the textbook ( $W = 182.0$ ,  $p = .022$ ), how interesting it was ( $W = 209.0$ ,  $p < 0.001$ ), and how relevant it was ( $W = 201.5$ ,  $p = .003$ ). Students who had acquired the textbook found it easier ( $M = 4.6$ ,  $SD = 3.7$ ) versus ( $M = 3.7$ ,  $SD = 1.2$ ) more interesting ( $M = 4.1$ ,  $SD = 1.1$ ) versus ( $M = 2.8$ ,  $SD = 1.0$ ) and more relevant ( $M = 4.5$ ,  $SD = 0.8$ ) versus ( $M = 3.3$ ,  $SD = 1.2$ ). There was no significant difference in the perceived cost of the textbook ( $W = 180.5$ ,  $p = .106$ ) as the mean indicate a neutral response ( $M = 2.50$ ,  $SD = 1.161$ ). Moreover, there was no significant difference in the perceived importance of training to read difficult texts ( $W = 200.0$ ,  $p = 0.317$ ) as the mean responses tended towards neutral ( $M = 3.5$ ,  $SD = 1.2$ ). Moreover, there were no differences across these student groups in any desire to have more video lectures ( $W = 177.0$ ,  $p = .764$ ) as both groups indicated that they would prefer more video-based lectures ( $M = 4.4$ ,  $SD = 1.0$ ). Moreover, both groups indicated a preference for a mix of traditional lectures and videos ( $M = 3.9$ ,  $SD = 1.2$ ). The perception of the importance of the traditional lectures was close to neutral ( $M = 3.2$ ,  $SD = 1.3$ ).

### 3.3 Effect of plans for further study

Of the 42 participants 21 indicated that they had ambitions to pursue further education, while 16 did not express such plans. There was a significant difference between these two groups in terms of desire for more video lectures ( $W = 234.0$ ,  $p = .021$ ), as the students with plans for further education were more positive towards more video lectures ( $M = 4.6$ ,  $SD = 0.9$ ) than those without such plans ( $M = 4.0$ ,  $SD = 1.1$ ). There also a significant difference in attitude towards working alone ( $W = 103.0$ ,  $p = .042$ ). The students who wanted to continue their studies were significantly less enthusiastic about working alone ( $M = 2.7$ ,  $SD = 1.3$ ) compared to those who did not want to continue to study after obtaining their degree ( $M = 3.6$ ,  $SD = 1.2$ ). There was also a significant difference in the perceived price of the textbook ( $W = 200$ ,  $p = .045$ ) as those who had plans for further education perceived the textbook as less expensive ( $M = 2.8$ ,  $SD = 1.1$ ) than those who had no further study plans ( $M = 2.1$ ,  $SD = 1.5$ ). Interestingly, there were no observed significant differences in attitudes towards developing writing abilities ( $W = 187.0$ ,  $p = .555$ ), developing abilities for reading advanced texts ( $W = 189$ ,  $p = .505$ ), freedom to choose topics for assignments ( $W = 191.5$ ,  $p = .464$ ), and the inclusion of more scientific articles in the curriculum ( $W = 173.0$ ,  $p = .440$ ).

### 3.4 Effects of prior work experience

Of the respondents who replied 18 indicated that they had several years of work experience prior to their current studies, while 19 participants did not have any work experience. When analyzing the data according to these two groups only one significant difference could be observed, namely that of the perceived useful knowledge acquired through the course ( $W = 107.0$ ,  $p = .048$ ). Those who had no previous work experience were more positive about what they have learned ( $M = 3.7$ ,  $SD = 0.9$ ) compared to those

who had previous work experience ( $M = 2.8$ ,  $SD = 1.5$ ). Interestingly, there was no significant difference between the groups in their perceptions of how useful the course was to be in their future profession ( $W = 109.5$ ,  $p = .056$ ). Overall, students were moderately positive towards the usefulness of the course ( $M = 3.5$ ,  $SD = 1.4$ ). There was also no observed difference in attitudes over prioritizing part-time jobs over attending curricular activities ( $W = 157.0$ ,  $p = .671$ ). Respondents indicated a negative attitude towards prioritizing part-time work ( $M = 2.5$ ,  $SD = 1.4$ ).

### 3.5 Effects of prior higher-education experience

Of the valid responses 9 students indicated having studied at higher level prior to the current study while 28 had not studied at higher levels before. There were two noticeable differences between these two groups, namely in the opinion about the adequacy of groups problem solving activities ( $W = 64.0$ ,  $p = .026$ ) and the perception of the task difficulties ( $W = 44.0$ ,  $p = .003$ ). Those with no previous study experiences expressed a stronger indication that there were too little plenary based problem-solving activities ( $M = 2.1$ ,  $SD = 1.5$ ) compared to those who had studied before ( $M = 3.4$ ,  $SD = 1.2$ ). Moreover, those who had not studied before found the coursework more difficult ( $M = 3.1$ ,  $SD = 1.1$ ) than those with previous study experience ( $M = 1.8$ ,  $SD = 1.0$ ). No significant differences could be observed for the importance of physical lectures ( $W = 122.0$ ,  $p = .899$ ), more video lectures ( $W = 108.0$ ,  $p = .475$ ), usefulness of class discussions ( $W = 95.0$ ,  $p = .267$ ), social contact with other students ( $W = 144.0$ ,  $p = .521$ ), preferences for group work ( $W = 94.5$ ,  $p = .259$ ), compulsory student presentations ( $W = 143.5$ ,  $p = .518$ ), exams versus portfolio evaluation ( $W = 143.5$ ,  $p = .503$ ), importance of improving writing abilities ( $W = 128$ ,  $p = 0.956$ ), abilities to read advanced texts ( $W = 94.0$ ,  $p = .248$ ) and preference for freedom in choosing assignments ( $W = 111.5$ ,  $p = .606$ ).

## 4 Discussions

### 4.1 Effects of textbooks

The results confirm the author's impression that only a fraction of the students acquires and actively uses the textbook, either through purchase, or via library loans. It is quite interesting that students who use the textbook were also more concerned with their writing abilities. One possible explanation is that some students were more text oriented and if they prefer to read, they may also prefer to write, or value the importance of good writing skills. On the other hands, students who were more hands-on who like to learn by trial and error rather than reading, may also be more interested in the actual artefacts created rather than describing these artefacts in words. One may also wonder whether the teachers who themselves usually are academically trained are text oriented and expect students to be so too, while some student may just want to get their degree and pursue a practical profession. On the other hand, although computer science is a practical field involving development and coding, it also involves reading of complex documentation and writing of the same documentation although the focus on documenting

code has become less than what is used to be as code is to be self-documenting. Another speculation is that students may have an inflated belief in writing tools such as Grammarly [24].

It is somewhat surprising that the students who actively used the textbook were less in favor of using more research articles. One possible explanation could be that some students like predictability and system and a textbook with a complete presentation of the syllabus may be an attractive benefit, while a set of research articles may come across as less organized and more chaotic. Why those who do not actively use the textbook were more positive towards research articles could be explained that they are usually free of charge, or that articles can be more updated knowledge if used in such a manner, and present a topic in a more focused manner compared to an introductory textbook.

The students who used the textbook were all more positive regarding the textbook in terms of how easy it was to use, how interesting it was and how relevant it was. This raises the important question about how the students who do not use the textbook could form an opinion about the book without having used it? Could it be that they had browsed the textbook in a bookstore or library and decided that it was not suitable for them, or were these responses based on an impression of textbooks in general? The results did not support the commonly held impression that students do not purchase textbooks due to their high cost.

The results did not show any evidence that textbook users were less in favor of say videos than those who do not use textbooks. The results could be interpreted as if students would like more videos, but not just videos. It seems the variety, and balance of traditional lectures, reading and video when these respective parts are applied sensibly, will contribute to learning.

It is somewhat concerning that the students in general, irrespective of being text/textbook oriented or not, did not find it important to develop their abilities to read difficult texts. Could this be because the students had not been exposed to sufficiently difficult texts in their studies, or is it because they did not realize that they most likely would have to read advanced documentation in their future careers?

## **4.2 Effect of plans for further study**

Students who reported ambitions for further study were both more positive towards video lectures and group work than those who did not want to continue studying after their degree. One possible explanation for these results is that a student who has further study plans may by natural selection be more academically inclined and thereby more independent with respect to getting hands-on help from the teachers. Yet, one could argue that to appreciate the benefits of group work and solving larger problems in collaboration with their peers.

Students who were interested in further study also did not perceive the textbook as expensive as those who did not want to continue studying. Again, could the perception of textbook cost be linked to the appreciation of the actual value of textbooks? Will a lower appreciation of the textbook result in the perception of higher cost?

It is a matter of concern that there was no difference between these two groups in how they valued the importance of academic articles as an academic research article is the stable ingredient of a researcher's life and we should expect that students who were purposing further study would have matured in their attitude towards research articles. The results indicate that students were quite impartial to the use of research articles in the curriculum. Perhaps students need to be better prepared for further education by motivating them for the importance and the general relevance of research articles? Also, it is concerning that there was no difference between the groups in terms of improving writing skills and abilities to read advanced texts as these are core academic skills needed in higher education. However, the scores were on the positive side for both groups suggesting that these skills were valued by most students.

### **4.3 Effects of prior work experience**

Although students were moderately positive towards the benefits of the course the students with prior work experience were less so compared to those without work experience. Possible explanations for this observation could be that the course perhaps is too theoretical and not sufficiently practical and therefore not matching their expectations. Or, perhaps these more experienced students simply were more critical than students recently finished secondary school? Another explanation could be that some of the students with prior work experience were already familiar with some of the contents of the curriculum such that they do not perceive that they have learned as much. However, it is also likely that their former work experience is not related to their future career plans and if so, the curriculum should cover new elements. The fact that there was no difference between the groups in terms of perceived usefulness for future career support support this view that past working experience is different from the future career. The respondents therefore might have been unable to make an informed assessment of this question.

The results suggest that students do not prioritize jobs over studies. This is contrary to the impressions by the author and colleagues as students often report that they were unable to attend lectures and supervision meetings due to job obligations. Consequently, if students do not attend optional learning activities there may be other causes. Perhaps students do not find enough value to merit the investment of time and effort to attend?

### **4.4 Effects of prior higher-education experience**

Students without previous higher education experience found there to be too little plenary problem-solving activities (typical of primary and secondary school), as well as finding the coursework more difficult as we would expect. Students with more experience have learned to become more independent and tackle more difficult problems.

The results also revealed that there were no differences in perceptions of learning writing and learning skills. This is somewhat surprising as one would expect more experienced students to have realized the importance of written communication. But the scores were generally positive, and it may therefore be unrealistic to observe any difference.



#### 4.5 Limitations

As the questionnaire was anonymous it is not possible to analyze the responses according to who attended lectures and not. In hindsight, a control question about lecture attending habits should have been included. One could expect that the perceptions of those who do regularly attend lectures and those who do not could be somewhat different.

### 5 Conclusions

A questionnaire-based study is reported where the goal was to probe students' perceptions towards emerging pedagogical issues in higher education. The results in general align with the new pedagogical ideas. In conclusion, the results support a mixed approach with a variety of learning activities and delivery methods are applied instead of just a single "silver-bullet" fix-it-all approach. One should also be careful not to necessarily follow requests from students uncritically, as students may prescribe the wrong medicine for "symptoms" that may be better addressed using other means.

#### References

1. Shih, T. K., Antoni, G. D., Arndt, T., Asirvatham, A., Chang, C. T., Chee, Y. S., et al.: A survey of distance education challenges and technologies. *International Journal of Distance Education Technologies* **1**(1), 1-20 (2003).
2. Gunawardena, C. N., McIsaac, M. S.: Distance education. In: *Handbook of research on educational communications and technology*, pp. 361-401. Routledge (2013).
3. Reeves, T. C.: Storms clouds on the digital education horizon. *Journal of Computing in Higher Education* **15**(3), (2003).
4. Ebben, M., Murphy, J. S.: Unpacking MOOC scholarly discourse: a review of nascent MOOC scholarship. *Learning, Media and Technology* **39**(3), 328-345 (2014).
5. Chen, C. M., Wu, C. H.: Effects of different video lecture types on sustained attention, emotion, cognitive load, and learning performance. *Computers & Education* **80**, 108-121 (2015).
6. Albrecht, U. V., Folta-Schoofs, K., Behrends, M., Von Jan, U.: Effects of mobile augmented reality learning compared to textbook learning on medical students: randomized controlled pilot study. *Journal of medical Internet research* **15**(8), (2013).
7. Irvine, V., Code, J., Richards, L.: Realigning higher education for the 21st-century learner through multi-access learning. *MERLOT Journal of Online Learning and Teaching* **9**(2), 172-186 (2013).
8. Lee, O., Luykx, A.: Science education and student diversity: Race/ethnicity, language, culture, and socioeconomic status. *Handbook of research on science education* **1**, 171-197 (2007).
9. El-Khawas, E.: The many dimensions of student diversity. *Student services: A handbook for the profession* **4**, 45-52 (2003).
10. Law, K. M., Sandnes, F. E., Jian, H. L., Huang, Y. P.: A comparative study of learning motivation among engineering students in South East Asia and beyond. *International Journal of Engineering Education* **25**(1), 144-151 (2009)
11. Jian, H.-L., Sandnes, F.E., Huang, Y.-P., Cai, L., Law, K.: On students' strategy-preferences for managing difficult course work. *IEEE Transactions on Education* **51**, 157-165 (2008)

12. Jian, H. L., Sandnes, F. E., Huang, Y. P., Huang, Y. M., Hagen, S.: Studies or Leisure?: a Cross-cultural Comparison of Taiwanese and Norwegian Engineering Students' Preferences for University Life. *International journal of engineering education* **26**, 227-235 (2010)
13. Jian, H.-L., Sandnes, F.E., Huang, Y.-P., Huang, Y.-M., Hagen, S.: Towards harmonious East-West educational partnerships: A study of cultural differences between Taiwanese and Norwegian engineering students. *Asia Pacific Education Review* **11**, 585-595 (2010)
14. Jian, H. L., Sandnes, F. E., Huang, Y. P., Huang, Y. M.: Cultural factors influencing Eastern and Western engineering students' choice of university. *European Journal of Engineering Education* **35**, 147-160 (2010)
15. Jian, H.-L., Sandnes, F.E., Huang, Y.-P., Law, K., Huang, Y.-M.: The role of electronic pocket dictionaries as an English learning tool among Chinese students. *Journal of Computer Assisted Learning* **25**, 503-514 (2009)
16. McGill, T. J., Klobas, J. E.: A task–technology fit view of learning management system impact. *Computers & Education* **52**(2), 496-508 (2009).
17. Sandnes, F. E., Eika, E.: A Simple MVC-Framework for Local Management of Online Course Material. In: Uskov V. Howlett R., Jain L. (eds.) *International Conference on Smart Education and Smart E-Learning. Smart Innovation, Systems and Technologies*, vol. 75, pp. 143-153. Springer, Cham. (2017).
18. Sandnes, F. E.: *Universell utforming av IKT-systemer*, Oslo: Universitetsforlaget, 2nd edition (2018).
19. Sandnes, F. E., Eika, E., Medola, F. O.: Improving the Usability of Interactive Systems by Incorporating Design Thinking into the Engineering Process: Raising Computer Science Students' Awareness of Quality versus Quantity in Ideation. In: *2019 5th Experiment International Conference*, pp. 172-176. IEEE (2019).
20. Sandnes, F. E., Eika, E., Medola, F. O.: Towards a framework for the design of quantitative experiments: Human-computer interaction and accessibility research. In: *International Conference on Universal Access in Human-Computer Interaction*, pp. 107-120. Springer, Cham (2018).
21. Sandnes, F. E., Eika, E.: Statistics-IDE: Supporting the design of empirical experiments for non-experts during early stages of research projects. In: *International Conference on Intelligent Human Systems Integration*, pp. 502-507. Springer, Cham (2018).
22. Sandnes, F. E., Eika, E.: Hostage of the Software: Experiences in Teaching Inferential Statistics to Undergraduate Human-Computer Interaction Students and a Survey of the Literature. In: *Research on e-Learning and ICT in Education*, pp. 167-183. Springer, Cham (2018).
23. JASP Team: JASP (Version 0.11.1)[Computer software] (2019).
24. Kaushik, H. M., Eika, E., Sandnes, F. E.: Towards Universal Accessibility on the Web: Do Grammar Checking Tools Improve Text Readability? In: *International Conference on Universal Access in Human-Computer Interaction*. Cham: Springer (2020).