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Managing Student Inclusion through Lecturer Visual Attention: An Eye-Tracking Study

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ABSTRACT: Contemporary higher education institutions increasingly emphasise inclusive education and student engagement within the learning process. Eye-tracking technology is recognised as an important method for analysing visual attention, cognitive processes, and interaction patterns in educational environments. However, research focusing on lecturers' visual attention distribution in higher education classrooms remains limited. Therefore, this study aims to analyse student inclusion during seminars based on a lecturer's eye-tracking research. The study was conducted using smart eye-tracking glasses that recorded the lecturer's eye movements, gaze direction, and visual attention distribution during two seminars in higher education. The collected data were analysed using heat map analysis to identify areas receiving the highest concentration of visual attention. The findings revealed that the lecturer's visual attention was unevenly distributed across the classroom, with the greatest concentration directed towards students seated in the central areas of the auditorium. Peripheral parts of the classroom received considerably less visual attention, suggesting that not all students were equally visually engaged in the interaction process. The results highlight the importance of lecturer awareness regarding attention distribution and demonstrate the potential of eye-tracking technology as a reflective tool for developing more inclusive teaching practices and supporting student engagement in higher education classrooms.

KEYWORDS: eye-tracking, higher education, student inclusion, visual attention, seminars, lecturer attention distribution, inclusive education.

INTRODUCTION

Contemporary higher education institutions face not only the challenge but also the responsibility of representing student diversity and implementing the principles of inclusion at both national and global levels. The European Union is strongly committed to ensuring inclusion in higher education while simultaneously focusing on providing high-quality education for all students (Juškevičienė, Valentukevičiūtė, 2022). Inclusion in higher education is directly related to the study process because, according to Nemtcan, Sæle, Gamst-Klaussen, and Svartdal (2020), all measures applied in the educational process – learning methods, strategies, approaches, and other forms of support – should respond to students' needs and abilities. At the same time, Samašonok, Kamienas, and Juškevičienė (2023) emphasize that successful student inclusion in the study process is an important factor in reducing early withdrawal from higher education institutions. The idea that limited inclusion may contribute to students' early dropout from higher education is also supported by the study of Mouton, Zhang, and Bernhard (2020), in which student withdrawal is associated with low engagement, overcrowded groups, and unmet expectations. For example, Alkan (2014) also highlights the importance of active student involvement in institutional activities, while Behr, Giese, Kamdjou, and Theune (2021) associate study dropout with students' unmet expectations towards higher education institutions. Since contemporary society increasingly focuses on diversity and inclusion issues (Valet, 2016; Zhaoa, Zhang, 2018; Priestley, Grammenos, 2021), the development of different forms of social activity that respond to individuals' needs becomes particularly important. Therefore, issues of inclusion in higher education institutions are becoming increasingly significant within the contexts of educational policy, the labour market, the academic community, and other sectors of society.

Strengthening the development of inclusive education in higher education, where attention is paid to the individual needs and opportunities of every student rather than focusing solely on clearly visible disabilities or disorders, may significantly broaden access to universities for a wider range of social groups, strengthen students' self-confidence, and contribute to their development as competent professionals. According to Saffa and Stan (2020), this also contributes to the productivity and competitiveness of the education system while reducing student dropout rates in higher education institutions. It should also be noted that one of the key Sustainable Development Goals (United Nations, 2015) is to ensure inclusive, equitable, and quality education for all and to promote lifelong learning opportunities. Eye-tracking technology is increasingly recognised as an important method for analysing visual attention, cognitive processes, and interaction patterns in different contexts. According to Novák, Masner, Benda, Šimek, and

Merunka (2024), eye-tracking technology enables researchers to analyse user interaction, identify usability-related problems, and even apply machine learning techniques to recognise emotions associated with user interaction. In educational research, eye-tracking studies are frequently used to investigate how individuals perceive and process visual information. Nisiforou and Laghos (2013) emphasise that eye-tracking technology may help identify individuals' cognitive dimensions and thinking styles by analysing their ability to focus on essential information while ignoring irrelevant environmental details. Their study suggests that eye-tracking may contribute to the assessment of cognitive characteristics and learning peculiarities, as well as to the development of more personalised and effective learning methods.

Similarly, Sáiz-Manzanares, Marticorena-Sánchez, Martín Antón, González-Díez, and Carbonero Martín (2024) analysed how eye-tracking technology helps to understand students' cognitive load in a virtual laboratory learning environment. The results demonstrated that participation in such learning environments improved learning outcomes and revealed different patterns of attention distribution and cognitive load, highlighting the potential of eye-tracking technology for the individualisation of learning processes. Eye-tracking studies are also applied in professional performance research. Durugbo (2021), comparing experts' and novices' visual search strategies in complex task environments simulating crime scene analysis, demonstrated that eye-tracking technology contributes to understanding work strategies and may support the creation of more effective and less stressful working environments.

In order to better understand the processes of student inclusion in higher education, it is important to analyse not only students' academic achievements or verbal participation in the study process, but also the distribution of lecturers' attention in the classroom, which may significantly influence students' engagement, visibility, and experiences of inclusion. Research (Wedel, 2015) has shown that eye-tracking, or the measurement and recording of a person's eye movements, is an important and increasingly used method for assessing visual attention. For example, eye-tracking technology provides insight into the challenges students face when solving text-based mathematics tasks (Paškovskė & Klizienė, 2024). Schweinberger, Watzka, and Girwidz (2023) use eye-tracking studies as a feedback tool to demonstrate to pre-service teachers the impact of their moderation on students. However, eye-movement measurement studies are more commonly used to investigate students' attention and cognitive performance in the educational process (Dahlstrom-Hakki et al., 2019). There is still limited research analysing lecturers' eye-tracking during lectures or seminars in order to investigate how visual attention is distributed among students in the classroom. Nevertheless, eye-tracking studies may provide important insights into student involvement in the educational process (Suero Montero, et al. (2022). Lecturer attention and eye contact are significant in higher education because they may influence students' emotional well-being, sense of belonging, engagement in the learning process, and academic participation. Consequently, analysing lecturers' visual attention distribution may provide valuable insights into inclusive teaching practices and students' experiences of inclusion within higher education classrooms.

This article aims to determine students' inclusion in a language didactics seminar based on a lecturer's eye-tracking study.

RESEARCH METHODOLOGY

The study was conducted using eye-tracking methodology. Smart eye-tracking glasses were used to record the lecturer's eye movements, gaze direction, and visual attention distribution during two seminars in higher education. The technology enabled the analysis of how the lecturer's visual attention was distributed across different areas of the classroom and among students during the seminars.

The collected data were analysed using heat map analysis, which visualises areas receiving the highest concentration of visual attention. Red areas indicate the highest concentration of gaze, while other colours represent lower levels of visual attention. The study aimed to identify patterns of lecturer visual attention distribution and their possible relation to student inclusion in the learning process.

RESEARCH ANALYSIS

A heat maps show where lecturer's eyes moved most frequently or stayed longest on the screen. It is important to mention red spots that indicate higher concentration,. Other colors areas without red spots point out areas under less scrutiny.

Seeking to help visualize how looks like the classroom in which was used eye tracking research, what was the spatial arrangement of the students and the lecturer, it was decided to attach the associative photo of classroom (see Figure 1).

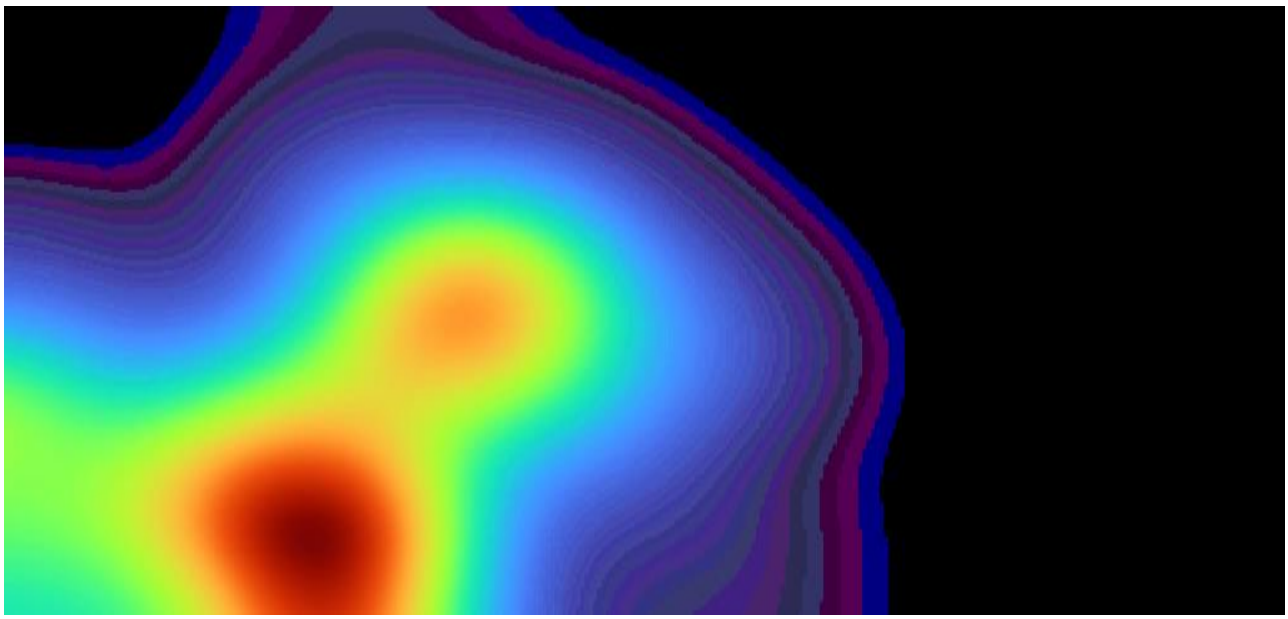


Figure 1. Lecturer's capturing the eye-tracking attention during the first seminar

As can be seen in Figure 2, during the first seminar, the lecturer's gaze was most frequently directed towards the central part of the classroom. This indicates that the lecturer maintained eye contact primarily with students seated in the middle area of the auditorium throughout most of the seminar. The heat map analysis reveals a limited distribution of visual attention across the classroom, as evidenced by the concentration of red and orange areas within a relatively narrow spatial zone. In contrast, the peripheral parts of the classroom received considerably less visual attention, suggesting that students seated in these areas were less frequently involved in direct eye contact with the lecturer. The findings imply that the lecturer's visual attention was not evenly distributed among all participants of the seminar. Such a tendency may occur unconsciously, as lecturers often naturally focus on students who are more visible, more active in discussions, or physically positioned closer to the centre of the classroom. However, from the perspective of inclusive education, unequal visual engagement may influence students' sense of participation, visibility, and belonging within the learning environment. Eye contact and visual attention are important elements of classroom interaction because they contribute to students' emotional comfort, engagement in discussions, and perceived recognition by the lecturer. The heat map also suggests that some students may remain on the periphery of interaction during the seminar, particularly those seated farther from the lecturer's primary field of vision. This may be especially relevant in the context of quieter or less active students, whose participation is often less verbally expressed and therefore may require more conscious attention from the lecturer. The results of the eye-tracking analysis encourage reflection on how lecturers distribute attention during seminars and how eye-tracking technology may be used as a tool for improving inclusive teaching practices and increasing awareness of classroom interaction patterns.

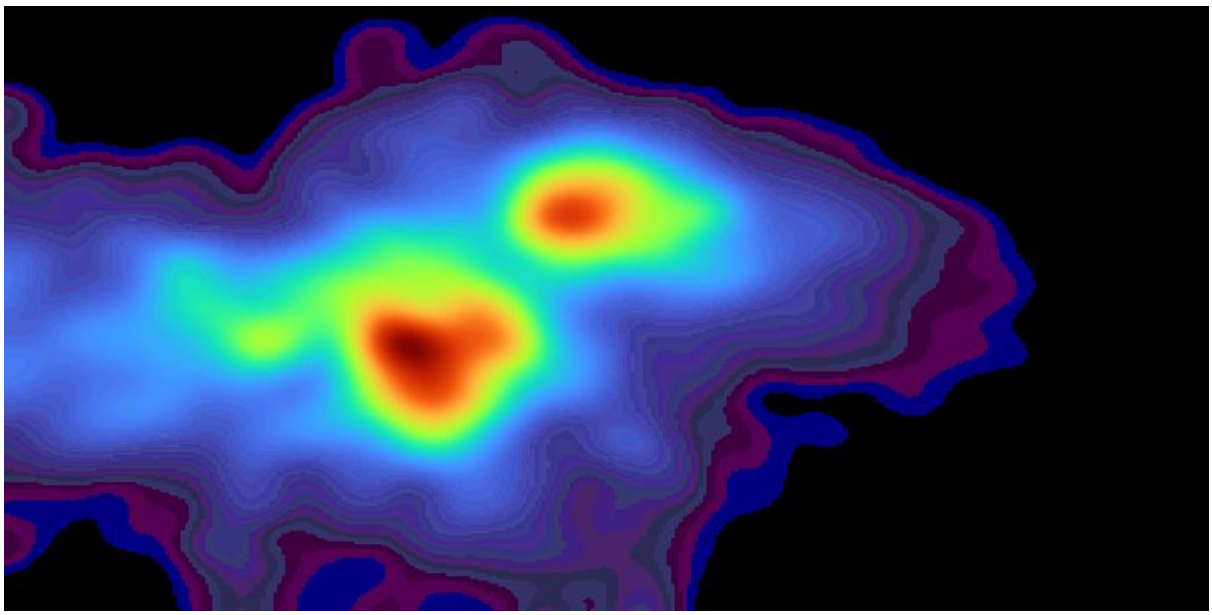


Figure 2. Lecturer's capturing the eye-tracking attention during the second seminar

As can be seen in Figure 2, the heat map reveals only a limited number of highly concentrated red areas, indicating that the lecturer's visual attention was focused on a relatively narrow part of the classroom during the second language didactics seminar. Two main areas of attention can be identified: one located near the central part of the auditorium and another positioned more towards the side of the classroom. These areas represent the locations where the lecturer's gaze most frequently moved or remained for the longest periods of time during the seminar. The findings demonstrate that the lecturer's eye contact was concentrated on two specific groups or locations of students rather than being evenly distributed throughout the classroom. Although some visual attention reached different parts of the auditorium, the heat map suggests that several areas remained considerably less visually engaged. This uneven distribution of gaze may indicate that certain students received more opportunities for interaction, acknowledgement, and inclusion in the learning process than others. From the perspective of inclusive education, the results are significant because lecturer eye contact and visual attention are closely related to students' feelings of recognition, participation, and engagement in classroom activities. Students who receive more frequent visual attention may feel more encouraged to participate in discussions, while students positioned outside the lecturer's primary focus areas may become less visible within the interaction process. Such patterns may emerge unintentionally, influenced by classroom layout, student activity, seating arrangements, or the lecturer's natural attention tendencies. The eye-tracking analysis also highlights the importance of lecturer self-reflection in higher education teaching practice. The results suggest that lecturers may unconsciously direct their attention towards specific students or areas of the classroom, creating repeated centres of interaction. Therefore, eye-tracking technology can serve as a valuable reflective tool for identifying attention distribution patterns and encouraging more balanced engagement with all students during seminars. This may be particularly important for quieter or less active students, whose participation often depends not only on verbal interaction but also on the lecturer's ability to create an inclusive and psychologically supportive learning environment.

CONCLUSIONS

1. The study revealed that the lecturer's visual attention during seminars was unevenly distributed across the classroom, with the greatest concentration directed towards students located in the central areas of the auditorium. Students seated in peripheral areas received considerably less visual attention, indicating that not all students were equally involved in direct classroom interaction.
2. The findings demonstrate that lecturer eye contact and visual attention may influence students' visibility, participation, and sense of inclusion within higher education learning environments. Uneven attention distribution may unintentionally reduce engagement opportunities for quieter or less active students, whose participation is often less verbally expressed.
3. Eye-tracking technology proved to be a valuable reflective and analytical tool for identifying classroom interaction patterns and lecturer attention distribution. The use of eye-tracking data may support lecturers' professional self-reflection, contribute to the development of more inclusive teaching strategies, and promote more balanced student engagement in higher education seminars.
4. The study also highlights the broader potential of eye-tracking methodology in higher education research and academic practice. The analysis of lecturer visual attention may contribute to improving communication management, inclusive learning environments, and student-centred teaching approaches in contemporary higher education institutions.

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