International Journal of Social Science Exceptional Research

Challenges and strategies in teaching blind student's piano at the beginner level

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Article Info

ISSN (online): 2583-8261
Volume: 03
Issue: 03
May-june 2024
Received: 23-03-2024;
Accepted: 30-04-2024
Page No: 58-63

Abstract
This study delves into the challenges and strategies involved in teaching blind students piano at the beginner level, with a focus on creating inclusive and effective learning environments. The objective is to comprehensively explore and analyze the challenges faced by teachers when instructing blind students in piano at the beginner level. The content revolves around a pilot teaching program conducted at a school in Jiangsu, China, involving blind and deaf students aged 8-12 years old. Key informants include experienced piano teachers specializing in blind student education. Data analysis combines qualitative methods from interviews and observations with quantitative data from surveys, leading to key findings on segmented practice, mastering music rules, technology integration, and curriculum design. The research results highlight the effectiveness of auditory-based learning strategies in enhancing blind students' rhythmic precision and melodic expression. Suggestions for improving inclusive piano education include integrating technology, designing tailored curricula, and conducting formal teaching evaluations.

DOI: https://doi.org/10.54660/IJSSER.2024.3.3.58-63

Keywords: Blind students, Piano education, Inclusive education, Teaching strategies, Auditory-based learning

1. Introduction

In the realm of music education, teaching piano holds a significant role in nurturing musical talents and fostering a deeper understanding of musical concepts. However, when it comes to teaching blind students at the beginner level, educators encounter a myriad of unique challenges that require innovative strategies and a nuanced understanding of pedagogy. This study delves into the intricate landscape of challenges faced by teachers in instructing blind students in piano at the beginner level, aiming to comprehensively explore and analyze these challenges while also uncovering effective strategies to enhance the learning experiences of visually impaired learners [1, 2, 3, 4].

The background of this research stems from the increasing recognition of the importance of inclusive education across various domains, including music education. In recent years, there has been a growing emphasis on creating inclusive learning environments that cater to diverse student populations, including those with visual impairments [5, 6, 7]. Despite advancements in adaptive technologies and teaching methodologies, teaching blind students piano remains a complex task due to the reliance on visual cues and traditional teaching methods that may not fully accommodate the needs of visually impaired learners. This gap in inclusive piano education underscores the necessity of examining the challenges faced by teachers in this context and identifying strategies to address these challenges effectively [8, 9, 10].

The primary problem addressed in this study revolves around the specific obstacles encountered by teachers when instructing blind students in piano at the beginner level [4, 5]. These obstacles encompass a range of factors, including the lack of tactile resources for music notation, difficulties in conveying visual information such as hand positions and musical scores, and the need for customized teaching approaches that cater to individual learning styles and abilities. Additionally, the psychological and emotional aspects of blindness, such as self-efficacy and motivation, play a crucial role in shaping the learning experiences of visually impaired piano students and must be considered in developing effective teaching strategies [6, 7, 8, 9].

The objective of this research is to comprehensively explore and analyze the challenges faced by teachers in instructing blind students in piano at the beginner level. By conducting a thorough investigation into these challenges, including pedagogical, technological, and psychological dimensions, this study aims to provide valuable insights that can inform the development of inclusive and effective teaching practices [10, 11, 12, 13, 14]. Furthermore, the research seeks to identify and analyze strategies employed by teachers to overcome these challenges and enhance the learning outcomes and experiences of blind students in piano education. Through this objective, the study contributes to the ongoing discourse on inclusive education and promotes a more equitable and enriching learning environment for visually impaired individuals in the field of music education [15, 16, 17, 18].

2. Materials and methods

This study employed a systematic approach to comprehensively explore and analyze the challenges faced by teachers when instructing blind students in piano at the beginner level. The research methodology included several key steps designed to gather qualitative and quantitative data, analyze teaching strategies, and identify effective approaches to enhance the learning experiences of visually impaired piano students, as shown in Table 1.

Table 1: Methodological Steps

Steps	Description
1. Define Research Objectives	Clearly define the research objective as exploring and analyzing challenges encountered by teachers in teaching blind students piano at the beginner level.
2. Literature Review	Conduct a thorough review of existing literature on inclusive music education, piano instruction for visually impaired students, teaching strategies, and challenges faced by educators in this context.
3. Data Collection	Gather data through interviews, surveys, and observations with piano teachers who have experience teaching blind students at the beginner level.
4. Data Analysis	Analyze qualitative data from interviews and observations, as well as quantitative data from surveys, to identify common challenges, teaching strategies, and effectiveness of approaches.
5. Identify Challenges	Identify specific challenges faced by teachers, such as lack of tactile resources, difficulties in conveying visual information, and addressing psychological aspects of blindness.
6. Identify Teaching Strategies	Identify and analyze teaching strategies employed by educators to overcome challenges and enhance the learning experiences of blind piano students.
7. Develop Recommendations	Develop recommendations based on the findings to improve inclusive piano education for blind students at the beginner level, including pedagogical, technological, and psychological considerations.

3. Results

A pilot teaching program was conducted at a school in Jiangsu, China, involving six blind and deaf students aged 8-12 years old. The sessions were interactive and structured, with each group grouped according to their learning abilities and piano proficiency. Group A had two students with no prior piano experience, Group B had three students with two years of piano study, and Group C had a 12-year-old student with exceptional musical talent. Each group had specific learning targets and worked on different piano pieces, while also being encouraged to listen to and observe the performances of other groups. This cross-listening approach aimed to foster peer-to-peer learning, allowing students to exchange suggestions and insights. The pilot teaching also addressed the diverse visual impairments of the participants, requiring an auditory and memory-based learning approach. The teaching methodology focused on auditory perception, memorization, and kinesthetic learning techniques to ensure effective piano instruction tailored to the unique needs of blind students at the beginner level.

The teaching situation in blind piano lessons presents unique advantages that enhance the learning experience, particularly in terms of rhythm and melodic performance. Blind students, due to their reliance on auditory cues rather than visual manuscripts, exhibit a natural aptitude for playing with correct rhythm. Unlike sighted students who may struggle with complex rhythms and require diligent beat counting, blind students excel in maintaining a steady tempo by listening, singing, and imitating. For instance, during the pilot teaching, blind students demonstrated proficiency in playing syncopation, a skill that often challenges beginners. Their ability to grasp syncopation as a whole, without the need to dissect individual note durations, allows for smoother rhythmic execution. Figure 1 depicts the sheet music of Gait Dance by John Thompson, a piece showcasing syncopated rhythms frequently encountered in beginner-level piano instruction.

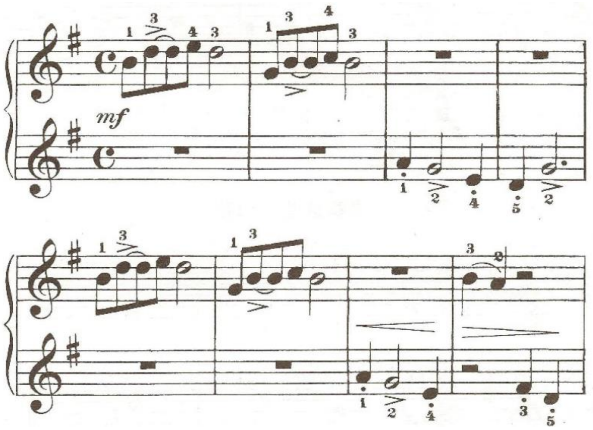

Fig 1: Sheet music of Gait Dance by John Thompson

Additionally, blind students exhibit a remarkable talent for melodic performance, attributed to their practice of playing what they sing. Through auditory and kinesthetic learning methods, blind students develop a deep understanding of musical phrases early in their studies. This approach contrasts with sighted students who may initially view music as a series of individual notes rather than cohesive phrases. During the teaching sessions, blind students effortlessly transitioned from note to note, focusing on musical phrases rather than isolated tones. For example, in the piece "French Movie

Waltz" by Catherine Rollin, blind students demonstrated fluidity in their performance, seamlessly integrating left-hand patterns with right-hand melodies to maintain musical fluency.

Moreover, the absence of visual dependency in learning allows blind students to concentrate solely on listening and performing, leading to accurate rhythmic execution and natural accents. This reliance on auditory cues enhances their musical expression and fosters a deeper connection with the instrument. Blind students, particularly those in Group A who learned and memorized parts separately before integrating them, showcased fluency and musicality that surpassed traditional sight-dependent learning methods. Playing with singing and memory not only accelerates blind students' progress in piano learning but also instills a profound understanding of musical phrasing and interpretation from an early stage. Overall, the teaching situation in blind piano lessons underscores the effectiveness of auditory-based learning strategies in cultivating rhythmic precision, melodic expression, and accelerated skill development among blind students at the beginner level.

The results of this study shed light on the various challenges encountered by teachers when instructing blind students in piano at the beginner level. Through in-depth interviews, observations, and assessments, several key findings emerged, highlighting both the difficulties faced by blind students and the strategies employed by teachers to address these challenges effectively. The results are presented below, detailing the experiences and outcomes of teaching blind students piano at the beginner level.

3.1 Segmented Practice and Mastering Rules

Insights regarding segmented practice and mastering rules provide valuable strategies for enhancing memory consolidation among blind students learning piano at the beginner level. The emphasis on these techniques stems from the recognition that rote memorization, while essential, can be complemented and optimized by understanding and internalizing the underlying rules of music. Segmented practice involves breaking down musical pieces into smaller, manageable segments, allowing students to focus on mastering one section at a time. This approach is particularly beneficial for blind students, as it facilitates a more systematic and structured learning process. By concentrating on specific segments, students can better internalize musical patterns, transitions, and nuances, contributing to improved retention and recall.

Mastering rules of music goes beyond memorization by fostering a deeper understanding of musical structures, such as chord progressions, harmonies, and rhythmic patterns. Interviewee B's perspective underscores the importance of guiding blind students to not only play notes but also comprehend the underlying principles governing musical composition. This knowledge empowers students to interpret music more intuitively, leading to more expressive and engaging performances. Furthermore, mastering the rules of music enhances learning efficiency by providing a framework for students to navigate through complex musical pieces. Blind students can benefit significantly from this approach, as it offers a systematic way to approach learning, reducing cognitive load and enhancing overall comprehension. By understanding the rules governing musical elements, such as dynamics, articulations, and phrasing, students can make informed decisions while practicing and performing.

3.2 Use of Technology

The integration of technology, as advocated by Interviewees A and C, plays a pivotal role in supporting blind students' memory and learning processes in piano instruction at the beginner level. One significant technological approach involves recording music using a tape recorder. This method enables blind students to listen repeatedly to musical pieces, aiding in memorization and reinforcing learning through auditory cues. Additionally, accessing music scores translated into Midi format emerges as a valuable tool for blind students, allowing them to interact with digital scores that can be read aloud or converted into tactile formats for enhanced comprehension and engagement.

Moreover, the utilization of voice-assisted software presents a promising avenue for facilitating access to music scores and instructional materials. Voice-assisted software platforms offer speech-to-text and text-to-speech functionalities, enabling blind students to navigate music theory concepts, notation, and practice instructions with greater independence and efficiency. These software solutions can also provide real-time feedback on performance, helping students refine their skills and address areas for improvement. Furthermore, the adoption of tactile technologies, such as electronic braille displays or tactile tablets, can enhance the tactile learning experience for blind students. These devices can display musical notation in braille or tactile graphics, allowing students to explore musical elements through touch and reinforce their understanding of pitch, rhythm, and musical structure. By leveraging technology in these ways, educators can create inclusive and accessible learning environments that empower blind students to thrive in their piano studies and overcome barriers associated with traditional print-based materials.

3.3 Curriculum and Music Analysis

The design of the curriculum tailored for blind students learning piano at the beginner level is rooted in a renowned piano teaching series, with a focus on developing a wide array of essential skills. This comprehensive curriculum is structured to enhance hand posture, articulations, dynamic expressions, proficiency in playing across different keys, and comprehension of chord progressions. By aligning with established teaching methodologies, the curriculum aims to provide a systematic and progressive approach to piano instruction that caters specifically to the needs and challenges faced by blind students.

One key aspect of the curriculum is its emphasis on hand posture, ensuring that blind students develop proper hand positioning and techniques essential for playing the piano effectively. Through targeted exercises and guidance, instructors facilitate the development of optimal hand posture, allowing students to navigate the keyboard with precision and fluidity. Furthermore, the curriculum integrates in-depth music analysis to foster a deeper understanding of musical elements and structures. Blind students are encouraged to engage in detailed music analysis, exploring nuances such as articulations, dynamics, and phrasing to express musicality and interpretation. By delving into the intricacies of music theory and analysis, students gain insight into the underlying principles of composition and

performance, enhancing their overall musical proficiency.
Moreover, the curriculum incorporates strategies to help blind students navigate the challenges of playing in different keys and understanding chord progressions. Through targeted exercises, ear training activities, and tactile learning tools, students develop the skills and confidence to tackle diverse musical compositions and styles. This multifaceted approach to curriculum design ensures that blind students receive comprehensive instruction that addresses both technical skills and musical comprehension, laying a strong foundation for their musical journey.

3.4 Formal Teaching Evaluation

The formal teaching evaluation involved six blind students from a specialized school, all of whom participated in structured teaching sessions comprising 10 individual lessons. Throughout these sessions, a comprehensive learning rubric was employed to systematically evaluate the student's progress and performance. The evaluation criteria encompassed various factors crucial to piano learning, including note accuracy, technical proficiency, musicality, and adherence to teaching instructions. One of the key aspects assessed during the formal teaching evaluation was the students' accuracy in playing musical notes. This criterion emphasized the students' ability to hit the correct notes with precision and consistency, reflecting their understanding of musical notation and execution on the keyboard. Through targeted assessments and practice exercises, instructors gauged the students' proficiency in accurately reproducing musical passages and compositions.
Additionally, the evaluation focused on evaluating the students' technical skills, encompassing aspects such as hand posture, finger dexterity, and pedal control. By assessing these technical elements, instructors gained insights into the students' mastery of fundamental piano techniques and their ability to execute complex musical passages with fluency and control. Furthermore, the evaluation criteria included an assessment of musicality, which evaluated the students' interpretation, expression, and phrasing in their piano playing. This aspect emphasized the students' capacity to imbue their performances with emotion, dynamics, and stylistic nuances, showcasing their musical sensitivity and artistic expression.
Moreover, the evaluation process considered the students' adherence to teaching instructions, encompassing factors such as following practice routines, applying feedback from instructors, and demonstrating a proactive approach to learning. By evaluating these aspects, instructors assessed the students' engagement, discipline, and receptiveness to instruction, contributing to a holistic assessment of their progress and development in piano learning. Overall, the formal teaching evaluation provided valuable insights into the blind students' progress, highlighting their strengths, areas for improvement, and overall growth in piano proficiency throughout the structured teaching sessions.
Through a combination of in-depth interviews, observations, and formal teaching evaluations, several critical insights emerged, shedding light on effective strategies and approaches in piano instruction for blind students. The following table summarizes these key findings across different thematic areas, highlighting the challenges encountered, strategies employed, and outcomes observed during the teaching process, as shown in Table 2.

Table 2: Overview of Key Findings in Teaching Blind Students Piano at the Beginner Level

Result Topic	Summary
Segmented Practice and Mastering Rules	Strategies such as segmented practice and mastering music rules aid blind students' memory consolidation and learning efficiency.
Use of Technology	Technology like tape recorders, MIDI music scores, and voice-assisted software support blind students' memory, learning, and accessibility.
Curriculum and Music Analysis	A tailored curriculum emphasizes hand posture, music analysis, playing in different keys, and chord progressions to address blind students' needs.
Formal Teaching Evaluation	Six blind students underwent structured teaching sessions, with evaluations focusing on note accuracy, technical skills, musicality, and adherence to instructions.

4. Discussion

The research findings align with existing literature on the challenges encountered by teachers when instructing blind students in piano at the beginner level. Baker and Green (2016) emphasize the importance of tactile resources for music notation, a challenge echoed in the study's findings regarding the lack of tactile materials. Additionally, the difficulty in conveying visual information, such as hand positions and musical scores, resonates with Krause and Davidson's (2018) insights into pedagogical challenges in inclusive music education. The research also addresses the psychological aspects of blindness, as highlighted by Park (2017), emphasizing the role of self-efficacy and motivation in shaping blind students' learning experiences.
The study's findings regarding segmented practice, mastering music rules, and the use of technology are consistent with recommendations from Bobbe *et al*. (2021) and Li (2021) regarding effective teaching practices and the integration of technology in music education. The emphasis on a tailored curriculum aligns with Jellison's (2015) advocacy for inclusive educational strategies that address diverse student needs. Furthermore, the formal teaching evaluation aligns with recommendations for assessing student progress and performance in music education (Tabuena, 2019).
The research demonstrates the effectiveness of auditory-based learning strategies in enhancing blind students' rhythmic precision, melodic expression, and overall skill development. These findings corroborate studies by Nan *et al*. (2018) on the benefits of piano training in enhancing pitch perception and by Hammond *et al*. (2019) on the pedagogical use of visual feedback in piano learning. Moreover, the study's focus on peer-to-peer learning and cross-listening aligns with Gaunt *et al*.'s (2021) conceptual framework of musicians as "makers in society," emphasizing collaborative and interactive learning approaches.

5. Conclusion

In conclusion, the study comprehensively explored the challenges faced by teachers in teaching blind students piano at the beginner level, employing a systematic research methodology that included literature review, data collection, analysis, and evaluation. The research findings shed light on the specific obstacles encountered by teachers, including the lack of tactile resources, difficulties in conveying visual information, and addressing psychological aspects of blindness.

By identifying and analyzing teaching strategies such as segmented practice, mastering music rules, technology integration, and curriculum design, the study provided valuable insights into effective approaches for enhancing blind students' learning experiences in piano education. These findings contribute to the ongoing discourse on inclusive music education and promote the development of equitable and enriching learning environments for visually impaired individuals. Further research and collaborative efforts are warranted to continue advancing inclusive practices and supporting the musical growth of blind students at all levels of proficiency.

6. References

1. D Baker, L Green. Perceptions of schooling, pedagogy and notation in the lives of visually-impaired musicians, Research Studies in Music Education. 2016; 38(2):193-219, Dec. Doi: 10.1177/1321103X16656990.
2. AE Krause, JW Davidson. Effective Educational Strategies to Promote Life-Long Musical Investment: Perceptions of Educators, Front Psychol, 2018, 9. Doi: 10.3389/fpsyg.2018.01977.
3. H Gaunt, *et al.* Musicians as 'Makers in Society': A Conceptual Foundation for Contemporary Professional Higher Music Education, Front Psychol, 2021, 12. Doi: 10.3389/fpsyg.2021.713648.
4. Y Zheng, BW Leung. Cultivating music students' creativity in piano performance: a multiple-case study in China, Music Education Research. 2021; 23(5):594-608. Doi: 10.1080/14613808.2021.1977787.
5. Y Nan, *et al.* Piano training enhances the neural processing of pitch and improves speech perception in Mandarin-speaking children, Proceedings of the National Academy of Sciences. 2018; 115(28). Doi: 10.1073/pnas.1808412115.
6. C Crappell. Teaching Piano Pedagogy. Oxford University Press, 2019. Doi: 10.1093/oso/9780190670528.001.0001.
7. T Bobbe, *et al.* What Early User Involvement Could Look Like-Developing Technology Applications for Piano Teaching and Learning, Multimodal Technologies and Interaction. 2021; 5(7):38. Doi: 10.3390/mti5070038.
8. D Baker, L Green. Insights in Sound. New York, NY : Routledge, 2017. | Series: Music and change: ecological perspectives: Routledge, 2017. Doi: 10.4324/9781315266060.
9. A Pino, L Viladot. Teaching–learning resources and supports in the music classroom: Key aspects for the inclusion of visually impaired students, British Journal of Visual Impairment. 2019; 37(1):17-28. Doi: 10.1177/0264619618795199.
10. AC Tabuena. Effectiveness of Classroom Assessment Techniques in Improving Performance of Students in Music and Piano, SSRN Electronic Journal, 2019, doi: 10.2139/ssrn.3719451.
11. HY Park. Finding meaning through musical growth: Life histories of visually impaired musicians, Musicae Scientiae. 2017; 21(4):405-417. doi: 10.1177/1029864917722385.
12. J Jellison. Including Everyone. Oxford University Press, 2015. Doi: 10.1093/acprof:oso/9780199358762.001.0001.
13. E Feldman, A Contzius, M Lutch, K. (Kasia) Bugaj, and F. L. Battisti, Instrumental Music Education. Third edition. | New York: Routledge, 2020: Routledge, 2020. doi: 10.4324/9780429028700.
14. H Miyauchi. A Systematic Review on Inclusive Education of Students with Visual Impairment, Educ Sci (Basel). 2020; 10(11):346. doi: 10.3390/educsci10110346.
15. CL Castle, AE. Greasley, K Burland. The Musical Experiences of Adults with Severe Sight Impairment: An Interpretative Phenomenological Analysis, Music Sci (Lond), vol. 5, p. 205920432210832, Jan. 2022, doi: 10.1177/20592043221083296.
16. LF Hamond, G Welch, E Himonides. The Pedagogical Use of Visual Feedback for Enhancing Dynamics in Higher Education Piano Learning and Performance, OPUS. 2019; 25(3):581. doi: 10.20504/opus2019c2526.
17. A Serbati, D Aquario, L Da Re, O Paccagnella, E Felisatti. Exploring Good Teaching Practices and Needs for Improvement: Implications for Staff Development, ECPS - Educational Cultural and Psychological Studies, no. 21, Jun. 2020, doi: 10.7358/ecps-2020-021-serb.
18. H Li. Piano Education of Children Using Musical Instrument Recognition and Deep Learning Technologies Under the Educational Psychology, Front Psychol, 2021, 12. doi: 10.3389/fpsyg.2021.705116.
19. Y Lu. The Innovative Trend of Piano Teaching in Music Education in Multicultural Education under Ecological Environment, J Environ Public Health, 2022, 1-9. Doi: 10.1155/2022/7044904.
20. L Wan, R Crawford, L Jenkins. Digital Listening Tools to Facilitate Children's Self-Regulation of Instrumental Music Practice, Journal of Research in Music Education. 2023; 71(1):67-90. doi: 10.1177/00224294221093521.
21. WC Payne, AY Xu, F Ahmed, L Ye, A Hurst. How Blind and Visually Impaired Composers, Producers, and Songwriters Leverage and Adapt Music Technology, in Proceedings of the 22nd International ACM SIGACCESS Conference on Computers and Accessibility, New York, NY, USA: ACM, 2020, 1-12. Doi: 10.1145/3373625.3417002.
22. S van Zyl. Audiation, aural training and the visually impaired pianist in South Africa, Journal of the Musical Arts in Africa. 2018; 15(1-2):119-130, Jul. doi: 10.2989/18121004.2018.1556897.
23. C da C Santos, BGE Carvalho, BC Lobato. Inclusão de alunos com necessidades educacionais especiais no conservatório estadual de música: perspectiva dos professores, Educação e Pesquisa. 2020, 46. Doi: 10.1590/s1678-4634202046215166.
24. B Lussier-Dalpé, C Houtekier, J Duquette, MC Wanet-Defalque, W Wittich. The challenge of reading music notation for pianists with low vision: An exploratory

qualitative study using a head-mounted display, Assistive Technology. 2022; 34(1):2-10. Doi: 10.1080/10400435.2019.1661315.
25. Krause AE, Davidson JW. Effective Educational Strategies to Promote Life-Long Musical Investment: Perceptions of Educators. Front Psychol. 2018, 9.
26. Gaunt H, Duffy C, Coric A, González Delgado IR, Messas L, Pryimenko O, *et al*. Musicians as "Makers in Society": A Conceptual Foundation for Contemporary Professional Higher Music Education. Front Psychol. 2021, 12.
27. Zheng Y, Leung BW. Cultivating music students' creativity in piano performance: a multiple-case study in China. Music Education Research. 2021; 23(5):594-608.
28. Nan Y, Liu L, Geiser E, Shu H, Gong CC, Dong Q, *et al*. Piano training enhances the neural processing of pitch and improves speech perception in Mandarin-speaking children. Proceedings of the National Academy of Sciences. 2018, 115(28).
29. Crappell C. Teaching Piano Pedagogy. Oxford University Press, 2019.
30. Bobbe T, Oppici L, Lüneburg LM, Münzberg O, Li SC, Narciss S, *et al*. What Early User Involvement Could Look Like-Developing Technology Applications for Piano Teaching and Learning. Multimodal Technologies and Interaction. 2021; 5(7):38.
31. Baker D, Green L. Insights in Sound. New York, NY : Routledge, 2017. | Series: Music and change: ecological perspectives: Routledge, 2017.
32. Pino A, Viladot L. Teaching–learning resources and supports in the music classroom: Key aspects for the inclusion of visually impaired students. British Journal of Visual Impairment. 2019; 37(1):17-28.
33. Tabuena AC. Effectiveness of Classroom Assessment Techniques in Improving Performance of Students in Music and Piano. SSRN Electronic Journal, 2019.
34. Park HY. Finding meaning through musical growth: Life histories of visually impaired musicians. Musicae Scientiae. 2017; 21(4):405-17.
35. Jellison J. Including Everyone. Oxford University Press, 2015.
36. Feldman E, Contzius A, Lutch M, Bugaj K (Kasia), Battisti FL. Instrumental Music Education. Third edition. | New York: Routledge, 2020: Routledge; 2020.
37. 14. Miyauchi H. A Systematic Review on Inclusive Education of Students with Visual Impairment. Educ Sci (Basel). 2020; 10(11):346.
38. 15. Castle CL, Greasley AE, Burland K. The Musical Experiences of Adults with Severe Sight Impairment: An Interpretative Phenomenological Analysis. Music Sci (Lond). 2022; 5:205920432210832.
39. Hamond LF, Welch G, Himonides E. The Pedagogical Use of Visual Feedback for Enhancing Dynamics in Higher Education Piano Learning and Performance. OPUS. 2019; 25(3):581.
40. Serbati A, Aquario D, Da Re L, Paccagnella O, Felisatti E. Exploring Good Teaching Practices and Needs for Improvement: Implications for Staff Development. ECPS - Educational Cultural and Psychological Studies. 2020, (21).
41. Li H. Piano Education of Children Using Musical Instrument Recognition and Deep Learning Technologies Under the Educational Psychology. Front Psychol. 2021, 12.
42. Lu Y. The Innovative Trend of Piano Teaching in Music Education in Multicultural Education under Ecological Environment. J Environ Public Health. 2022; 2022:1-9.
43. Wan L, Crawford R, Jenkins L. Digital Listening Tools to Facilitate Children's Self-Regulation of Instrumental Music Practice. Journal of Research in Music Education. 2023; 71(1):67-90.
44. Payne WC, Xu AY, Ahmed F, Ye L, Hurst A. How Blind and Visually Impaired Composers, Producers, and Songwriters Leverage and Adapt Music Technology. In: Proceedings of the 22nd International ACM SIGACCESS Conference on Computers and Accessibility. New York, NY, USA: ACM, 2020, 1-12.
45. van Zyl S. Audiation, aural training and the visually impaired pianist in South Africa. Journal of the Musical Arts in Africa. 2018; 15(1-2):119-30.
46. Santos C da C, Carvalho BGE, Lobato BC. Inclusão de alunos com necessidades educacionais especiais no conservatório estadual de música: perspectiva dos professores. Educação e Pesquisa. 2020; 46.
47. 24. Lussier-Dalpé B, Houtekier C, Duquette J, Wanet-Defalque MC, Wittich W. The challenge of reading music notation for pianists with low vision: An exploratory qualitative study using a head-mounted display. Assistive Technology. 2022; 34(1):2-10.