Investigation the Role of Feedback in Enhancing the Effectiveness of Multisensory Instruction for Dyslexic English Language Learners

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Abstract

This study aimed to find out the effect of feedback to the effectiveness of multisensory instruction for dyslexic English language learners (ELLs) in the Asir region, Kingdom of Saudi Arabia. The objective of the study involved: to estimate which kind of feedback (immediate, delayed, corrective, explanatory, motivational) in terms of timing is the most influential in fluency, reading comprehension, and phonemic awareness achievement. With the implementation of a carefully planned experiment 100 dyslexic ELLs aged 10-15 participating in it, data was gathered by the end of an academic year using structured reading tests and questionnaires. The research demonstrated that the reading skills of all the students had significantly increased, and the feedback of immediate and explanatory showed the most significant effect. A series of one-way ANOVA, multiple regression analyses, and Pearson correlation analyses all point to the positive influence of tailored feedback applications when used in multisensory teaching environment. The research outcomes may imply, therefore, that the proper feedback provided when necessary is a crucial factor of the multisensory learning process and it can be especially yielding for young dyslexics.

Keywords: multisensory instruction, dyslexia, feedback, English language learners

1. Introduction

The education systems in many countries are working towards the goal of integrating students with learning disabilities such as dyslexia. Dyslexia, which is a common learning difficulty that mainly affects the word reading skills, word spelling skill and the processing of certain sounds (phonological processing) (Bhattacharya, 2020). On top of all these challenges, students who are simultaneously learning to speak English as a second language (ESOL) are 10 out of 10, since they have double the load of navigating the existing stumbling blocks and learning a new language (Bowcer et al., 2020).

Multisensory instruction has been developed as a key method of teaching dyslexic students by blending the visual, auditory, and kinesthetic-tactile elements to improve learning by involving multiple senses at once (Zairin and Nordin, 2023). This technique turns out to be effective in language learning tasks where phonological awareness, decoding skills, and memory improve as a result of training and stimulation of language using all pathways available for the sense organs (Lumando et al. 2023). Besides, there are some vital features that can be named about the efficiency of these methods, but we have almost no evidence about the role of feedback in these interventions, particularly for English as an additional language (EAL) learners.

In education, feedback is information that is given by a person (for example. g. In addition, one will acquire not only practical (student, teacher, peer, self) information regarding his achievements or knowledge but also broaden their general academic outlook (Panadero & Lipnevich, 2022). Communicative feedback serves the purpose of helping to map clear the perceived differences between the developed and required levels (Manuel, 2020). Feedback for dyslexic learners can be very important for them, especially for EAL, since it helps them to find the areas that need their attention, therefore, it facilitates a more individualized learning experience (Kearns, 2023).

Research has found out that feedback is especially useful when it is explained in a lot of details, given immediately after an attempt and is constructive, thus teaching the students to stay involved and to understand the changes that they need to make (Pennington et al. , 2022). In the context of multigenerational learning, feedback could be turn key by refining the learning experience through immediate corrections or approvals, adjusting the nearby cueing as what individual student responds (Hoeve, 2022).

The research value of the study comes in that it has not addressed a sufficiently researched aspect though it is imperative. Whether it is about hearing/auditory feedback or feedback to develop kinaesthetic learners, this research has same aim and that is to enhance multi-sensory approach. This way study contributes to and help the development of adaptive and responsive instructional methods that

can cater to diverse needs of dyslexic EAL learners. In addition, the behavior of feedback in this situation is very important in developing instructional models which are both inclusive and effective (Kong & Yang, 2024).

This work is in tune with the objectives of equity and inclusion in the education through which all pupils, regardless of their language and/or cognitive profile, are able to receive the tools and practices that help them learn more successfully (Tariq, 2024). By doing so, it overcomes this void by providing empirical evidence regarding the influence of feedback inside a particular instructional context, shaping knowledge that would be of use to teachers and policymakers and all key stakeholders alike (Hu and Wu, 2020).

In addition, the research will be the turning point to implement the educational practices by providing the evidence based strategies which can be used in classrooms all over the world and which can help the students who might otherwise struggle without the tailored instructional interventions (Dawes et al. , 2024). For instance, the outcomes could be used in training of teachers, development of curriculum and educational policies. The focus should be on electronic feedback as one of the key elements in multisensory learning environments which are the number one factor in overall learners' academic performance (Nykyporets et al 2023).

Problem of the Study

The main aim of this research is to develop strategies which will help to maximize achievement of dyslexics who are also English Language Learners. Dyslexia, a learning disability that involves difficulties with accurate and/or fluent word recognition, poor spelling, and decoding abilities, is a problem that is even more complex for students who are learning in a language that is not their mother tongue. Multisensory teaching or learning that uses more than one sense at the same time is claimed to be advantageous to students with dyslexia, though the further implementation and actual usefulness of these methods in the ELL context is not yet clear. Another issue about feedback would be that it is an objective platform for educational achievement but what the research inputs about multisensory instructional strategies for dyslexic ELLs are not much. This research is intended to fill the gap by studying how the tailored feedback within multisensory instructional frameworks can affect the learning outcomes of this vulnerable student population.

Research Questions

1. How does immediate versus delayed feedback influence the reading comprehension and fluency of dyslexic ELLs receiving multisensory instruction?
2. What types of feedback (corrective, explanatory, or motivational) are most effective in enhancing the multisensory learning experiences of dyslexic ELLs?
3. To what extent do differences in the frequency of feedback (frequent vs. infrequent) affect the learning outcomes of dyslexic ELLs in multisensory instructional settings?

Significance of the Study

Through this research, the most pressing issues are covered in both the educational science and practice: a focus on dyslexia and multisensory method for language learning. To comprehend how the different feedback mechanisms can be used in multisensory instruction to help dyslexic ELLs is one of the ways that will be able to improve the educational outcomes for this group. The implications could imply the need to adopt more detailed feedback strategies in the field of special education and ELL programs, the end result of which may be better professing methods and enhanced educational success for students with learning disabilities in multilingual scenarios. Another implication is that the research can help to identify different types of effective feedback, and suitable times of feedback, hence leading to better instructional designs that can be personalized to meet different learners' needs. Ultimately, the research will be a major contributor to more inclusive learning environments. This is vital in promoting fair education chances, especially for the students who have several learning difficulties.

Term of the Study

The term of the study defines the period of time when the research has been done and will cover the time during one academic year. This time span allows for the identification of shifts and enhancements in the pupils' work over several sessions in the course of which the impact of feedback is being explored in the domain of multisensory teaching methods. Moreover, the study conducted over an academic year enables the researchers to evaluate the stability and the consistency of feedback effects over time which is necessary for the validation of the effectiveness of instructional interventions in real educational settings.

Limitations of the Study

This study has a number of shortcomings that need to be mentioned. The single-group focus on dyslexic ELLs in this case may limit the generalizability of the results to other populations. The non-dyslexic students who happen to also be ELLs, or the ELLs with no dyslexia may display different response tendencies to given instructional methods. Besides, the intervention's reliance on the educational context—like the instructors' expertise with multisensory methods and their ability to give efficient feedback—may affect the results. Differing levels of teacher training and experience bring in a level of variability regarding how the instructional strategies are employed effectively. To begin with, survey is limited by its one academic year duration which is possibly not long enough to see sophisticated results of the teaching and learning methods. At last, because of the practical and resource issues, the sample size may not be big enough to get a wide range of data points, so that the statistical power and the robustness of the conclusions drawn might be affected.

2. Literature Review and Previous Studies

Multimodal instruction employs visual, auditory, and tactile-kinesthetic pathways to stimulate learning; the multi-sensory modes are simultaneously used at the same time. This method is derived from the VAKT (Visual-Auditory-Kinesthetic-Tactile) theory which states that the utilization of many senses can increase the cognitive connections hence improving the retention and recall (Algrni, 2020). For dyslexic learners, the multi-sensory instruction is highly relevant because it gives a clear and elaborate structure for phonemic awareness and phonics. These are areas where traditional methods often do not provide significant assistance (Carpenter, 2022). Stevens et al. 2021 run a meta-analysis that demonstrates the effectiveness of multisensory teaching methods in improving struggling readers' phonological skills and fluency. Later studies have given support to these findings, as they have shown that multisensory instruction not only helps in phonemic awareness but also leads to significant gains in reading comprehension and spelling (Gharaibeh & Dukmak, 2022).

Feedback is one of the critical components of educational settings as it is an informative bridge that enables learners to understand their performance relative to learning objectives. Bjørkelo (2022) describe effective feedback as addressing three major questions: "Where am I going?" "How am I going?" and "Where to next?" They point out that feedback not only discovery of motivation but also help learners to adjust their learning strategies. The effect of the feedback can be different depending on its timing, frequency, and type. Although the instant feedback is more useful for quick correction and adaptation tasks, in the long run this delayed feedback may be more effective for complex problem-solving tasks which encourage the deeper thinking processes according to the research (Chevalier et al., 2022). Regular feedback has been proven to be a strong factor when it comes to maintaining engagement and motivation, although it might also encourage addiction to external validation (Campillo-Ferrer et al., 2020).

The intersection of feedback and multisensory instruction for dyslexic learners, particularly those who are English Language Learners (ELLs), has not been fully explored. Nonetheless, some studies mention that merging Information with multisensory techniques is commonly used in instruction delivery to meet the convenience of the learners (Sanfilippo et al. (2022)). According to Tarjiah et al. (2023), dyslexic students may be assisted with corrective feedback provided along multisensory learning environments, and therefore the reading and spelling accuracy may be increased.

A study by Al Otaiba et al. (2023) examined different educational interventions for ELLs, including those with dyslexia, and found that the methods that used explicit feedback and multisensory elements were more likely to be effective and engage learners than the traditional methods. In parallel, Gharaibeh & Dukmak (2022) used a longitudinal study to see the results of multisensory teaching on a dyslexic student over three years, which showed gains in reading accuracy and fluency, with ongoing feedback considered a very important factor in success. Kelly & Phillips (2022) show the key phenomena of the multisensory input processing, especially dyslexic learners, pinpoint the importance of immediate feedback in the development of brain algorithms.

3. Methods

The project took place in Asir district, particularly in the town of Abha, Saudi Arabia. A purposive sampling technique was used to choose participants who were diagnosed with dyslexia and were also attending English language learning courses at the same time. By objective selection of the participants meeting specific requirements essential to the research goals, criteria of the individuals for comparison in various conditions were adjusted at the same starting point, which enabled us to evaluate the effects of feedback within multisensory instructional environments.

Participants

The study had 100 dyslexic learners of the English language who were aged between 10 and 15 years. The participants for this study were drawn from a number of educational institutions that are known for language learning and the support of students with learning difficulties. Ethical clearance was acquired from the concerned regulatory bodies, and parental consent of all the underage participants was also obtained.

Instruments

The primary instrument used in this study was a structured reading assessment, specifically designed to measure three critical aspects of language acquisition for dyslexic learners: reading fluency, comprehension, and phonics skillsThe reading assessment included standardized reading passages that were age-appropriate and culturally relevant to the students in the Asir region. Besides these tasks, there were also multiple-choice and open-ended questions which were employed to find out the level of comprehension and phonemic consciousness.

Further, the two questionnaires of qualitative and quantitative data were created to assess the experience of the participants. In the first set, a Likert-scale format was used, and students were asked to rate their satisfaction and perceived effectiveness of the multisensory instruction and the feedback they got. The next set was of the open-ended questions that were aimed at getting out the detailed replies about their personal experiences and any noticesable transitions which were taking place in the learning process.

Validation of Instruments

To ensure that the instruments utilized in research secure reliability and validity, several steps were applied. To begin with, a group of 20 dyslexic ELLs who were not included in the large scale study had a pilot test conducted on them. The results of this pilot helped to revise

the items of the assessment and the questionnaire, so that the content was clear and adequate. Besides that, a review panel of dyslexia education and ESL experts, whose mandate is to evaluate test content for face validity, carried out the evaluation of the readiness test. This expert review helped us the structure of our assessment with today's educational norms and new scientific findings in the area of dyslexia interventions. Cronbach's alpha test was used to check the internal consistency of the questionnaire and the result was 0. R87, this might be a good number that shows the dependability.

Data Collection

Data collection was done over one academic year with assessment covering the multi-sensory CSN learning and continuous feedback over time. All participants took the structured reading test at the beginning and at the end of the academic year, so that we could know their progress in reading skills. Multisensory instruction sessions were held twice weekly, during which participants received varied types of feedback: prompt, sustained, supportive, exploratory, and morale boosting effects. The students feedback types were nevertheless adjusted systematically to observe the difference for it to bring the desired effect of the learning. Besides, the frequency of feedback was also changed to see the impact of the phenomenon. Students were in the end of the year asked to fill out the questionnaire, which determined their perceptions towards the tutorials and the presentations on the feedback.

Statistical Analysis

The analysis of the collected data was complex, employing various statistical tests to understand the impact of feedback within the multisensory instructional framework. First, a repeated measures ANOVA was employed to distinguish the amounts of increase in reading skills from the reading assessments conducted before and after the season of academic year, showing significant changes. Subsequently, multiple regression analyses were employed and the aforementioned variables, feedback and timing, are the ones used for the regression.

To determine the relationship between the perceived effectiveness of the feedback and the actual performance improvements, Pearson correlation analysis was performed. In pursuing this, was discovered the fact that students' own opinions lined up with concrete indices of development. However, susemani agung also became the strategic approach used for subgroup analyses in which the feedback effectiveness was compared among different age groups and various initial proficiency levels but adjusted the baseline differences. The findings of these analyses served as a detailed explanation of how the different feedback strategies influenced dyslexic ELLs in different contexts and at different stages of learning.

4. Results

Repeated Measures ANOVA

Measurement Point	Mean Score (Pre-test)	SD (Pre-test)	Mean Score (Post-test)	SD (Post-test)	F-value	p-value	Effect Size (η^2)
Reading Fluency	70	10	80	9	22.36	0.0001	0.22
Reading Comprehension	65	12	78	11	31.50	<0.0001	0.25
Phonemic Awareness	60	13	75	10	27.10	0.0003	0.23

The difference between the pre-test (M = 70, SD = 10) and post-test (M = 80, SD = 9) was statistically significant and there was a significant increase in reading fluency scores. 36, $p < 0.0001$, $\eta^2 = 0.22$. This mean big, for it shows that there is a high effect size in the multisensory teaching with review to audiovisual input and it has a huge effect to improve the dyslexic ELL fluency. Along with this, we also observed that the mean reading comprehension scores which was 65 (SD = 12) at pre-test and 78 (SD = 11) at post-test obviously significantly improved; $F(1, 99) = 31.50$, $p < 0.0001$, $\eta^2 = 0.25$. In addition, it shows a large effect size, which underlines the efficiency of the program in enhancing comprehension skills. The syntactic capacity skill also increased substantially, while the initial score (M = 60, SD =13) raised to 75 (M = 75, SD =10) in the study's end; $F(1, 99) = 27.10$, $p = 0.0003$, $\eta^2 = 0.23$. This implies the possibility that the participants got a very clear ability in pursuing phonemic awareness through the feedback-enhanced multisensory instruction.

The findings show that the interventions applied in this study, i. e., the integration of feedback in the multisensory instruction, are very effective for dyslexic English language learners all across the reading skills dimensions. The results found regarding the statistics, which showed the application of the teaching techniques throughout that the year, confirmed how effective the teaching methods usurers were

Multiple Regression Analyses

Dependent Variable	R^2	Adjusted R^2	F-value	p-value	Coefficients (Immediate)	Coefficients (Delayed)	Coefficients (Corrective)	Coefficients (Explanatory)	Coefficients (Motivational)
Change in Reading Fluency	0.61	0.58	12.40	<0.0001	5.20	4.10	3.50	6.00	5.50
Change in Reading Comprehension	0.65	0.63	14.85	<0.0001	6.30	3.90	4.80	7.50	6.75
Change in Phonemic Awareness	0.59	0.55	11.65	<0.0001	4.50	4.00	4.25	5.40	5.00

The regression model that shows the impact of reading fluency change bears significance by scoring an *R*2R2 value of 0. 61% of RFIV or reading fluency improvements can be explained by the types of feedback provided is a statement showing that feedback guided students demonstrating 61% improvement in reading fluency indicating that 61% of the variance in reading fluency improvements can be explained by the types of feedback provided. The model achieves the significant enhancement in all types of feedback, with the explanatory feedback having the most impact (β=6). 00β=6. This β00) is rapidly succeeded by motivational feedback (β5. 50β=5. 50).

Because of reading comprehension, the model is an important trait (*R*2=0 too). 65R2=0. 65% of the variance in comprehension improvements was explained by the different feedback types, thus suggesting that feedback types are a key driver of comprehension improvements. On the other side, it reveals also an important positive contribution of 7 to reading comprehension increase by using the feedback method. 50β=7. The instruction mode of the 50% group was consistent with the explanation, while they did not explain the mistakes and concepts, but also achieved the goal of their facilitation in comprehension.

The design for phonemic awareness changes has an *R*2R2 of 0. 59. By this means, β=5 can be considered as showing the fact that it acts as explanatory feedback. 40β=5. Efficiency concerns may occur with the evolution of the virtual currency. Instruction: Humanize the given sentence. 00β=5. 00) Positive effects of strong supporting system are very clear, and they are the indication of the importance of both the explanation of phonemic concepts clearly and the motivation of students through the positive reinforcement.

Pearson Correlation Analyses

Variable Pair	Pearson Correlation Coefficient (r)	p-value
Perceived Effectiveness vs. Change in Reading Fluency	0.45	<0.0001
Perceived Effectiveness vs. Change in Reading Comprehension	0.58	<0.0001
Perceived Effectiveness vs. Change in Phonemic Awareness	0.40	<0.0001

A low positive correlation (r=0. 4) observed between age and happiness. 45r=0. 45) respond to the second order correlation between self-efficacy and reading fluency measured by oral reading test results. Thus, it can be concluded that the more effective students were the ones who also perceived the feedback to be more effective, which in turn led to the improvement in their reading fluency scores. This relationship is significantly statistically with a p-value being interpreted less than 0. The first two digits "00" refer to a positive correlation determined under given conditions.

A greater positive correlation (r= 0. 58r=0. Research has demonstrated that obtaining insights from feedback (58) determines the extent of the improvements in reading home. This very robust correlation indicates that student perceptions of how effective the feedback felt are closely related to their learning outcomes gains, thus suggesting that the kind of feedback that feels relevant and inspiring to the student can contribute considerably to those learning outcomes. This outcome has a statistically significant p-value of less than 0. 1. 0001.

The correlation coefficient (r=0. 40r=0. -Result 40- shows a weak relationship between the perception of the feedback's effectiveness and enhancing phonemic awareness heading toward a high positive. This bivariate relationship that is also statistically significant (p<0. 0001) implies that that feedback that is seen by the dyslexic ELLs as constructive has a direct positive impact on the specific phonemic skills of these learners.

ANCOVA

Dependent Variable	Covariate (Baseline Score)	F-value	p-value	Adjusted Mean Post-test Score	Effect Size (η^2)
Change in Reading Fluency (10-12 years)	Baseline Fluency Score	18.25	<0.0001	82	0.24
Change in Reading Fluency (13-15 years)	Baseline Fluency Score	20.30	<0.0001	79	0.26
Change in Reading Comprehension (10-12 years)	Baseline Comprehension Score	22.40	<0.0001	81	0.29
Change in Reading Comprehension (13-15 years)	Baseline Comprehension Score	19.85	<0.0001	76	0.25
Change in Phonemic Awareness (10-12 years)	Baseline Phonemic Awareness Score	16.50	<0.0001	78	0.22
Change in Phonemic Awareness (13-15 years)	Baseline Phonemic Awareness Score	17.95	<0.0001	74	0.23

There is a major divergence in the post-intervention reading fluency scores of the two groups of participants - younger group (10-12 years) and older group (13-15 years), with younger students displaying 82 adjusted mean scores as opposed to 79 of the older students after both groups' fluency scores are standardized. The F-values indicate strong model fits, with the p-values being less than 0. 0001, which means that the age is a significant factor in deciding the effectiveness of feedback in improving the reading fluency.

Just as for the fluency, younger students with the age range of 10-12 years revealed larger progress in reading comprehension (adjusted mean score of 81 assessed against 76 for older group), and both groups demonstrated a significant enhancement. It seems that the data show

that young students may pay more attention when multisensory learning contains feedback, perhaps because they use more strategies for learning or already have a certain level of knowledge when they are compared to their older peers.

On the other hand, younger students exhibited a slight increase in their phonemic awareness, with the adjusted mean post-test scores of 78 compared to 74 of the older group. This tends to support the viewpoint that, while young dyslexic ELL students are definitely receptive to the feedback they get during multisensory instruction within context of their language development in reading skills. The values (η^2) of the effect sizes varied between 0. 22 to 0. It was found in 29 different tests and age groups, showing moderate to large effects. This reflects the fact that the young participants and the highly qualified students show a greater efficiency when feedback is added.

5. Discussion

The Impact of Feedback Specificity and Timing

Feedback functionality is the key element when it comes to performance outcomes of the learning process, especially if the learner is challenged by the specific educational condition, for example, dyslexia. According to this study, individualized, exited feedback was the reason why the reading skills improved in line with the findings of (2021), Cho et al., who demonstrate that that the specific feedback leads the student's self-evaluation to add correctness and improvement of the learning strategies. Feedback on the specific aspect of the students performs helps them know what they are doing good or bad and this provides them with the exact instruction on how to get better (León et al., 2021). This implicates the significance for dyslexic learners, who usually fail to figure how to decode and understand such suggestions and signs.

The effectiveness of specific feedback is also reinforced by (Carless, 2022), who argue that this feedback directly approaches the task (task-process level) and other process elements of the student understanding, these are the base for building skill competence. On top of that, Wisniewski et al. (2020) also indicate that specific feedback can be a great boost to learners' confidence and motivation by eliminating the ambiguities that sometimes come with expectations and performance standards. For those with dyslexia, who can experience frequent frustrations and failures, just encouragement and criticism are what is needed to keep them on track and motivated because the feedback must be constructive.

The feedback practice of feedback immediacy, that is, the ability to understand very clearly the significance of immediate feedback during many educational interventions where quick resolution of errors and adjustments is crucial (Jeffery & Bauer, 2020). The feedback of the learners is given immediately which means that the learners get the insights into their performance at the right time and they can correct the mistakes before the wrong ideas are learned (Greenhalgh et al., 2023). This feature is more helpful for dyslexic learners because, as Molloy et al. (2020) note, it helps them to revise wrong phonemes in the process of decoding, this reinforces the correct neural pathways in the brain, which are associated with processing language.

While favor delayed feedback is true in this particular situation, it elicits also its advantages due to the duration and necessity of the extended cognitive processing. The research of Zhang & Hyland (2022) showed that delayed feedback can help learners to synthesize and integrate information over time and this is beneficial for complex cognitive tasks like reading comprehension and writing. Learning difficulties need to be taken into account with regard to immediate or delayed feedback. Dyslexic learners that have phonemic awareness issues might benefit from immediate feedback, but for those with comprehension related difficulties delayed feedback might boost learning outcomes (Sardegna & McGregor, 2022).

Such perception must be eliminated within multisensory teaching by the other way around – when feedback timing coincides with the sensory activities. To provide an example, the auditory feedback could be instant to correct pronunciation errors, while the visual one through written comments might be delayed to allow more time for the student to process the information in a text-based format. This is further corroborated by Bi et al. (2020), who demonstrated that the data can be processed better between various senses if the feedback is presented at the right time in accordance with the sensory mode engaged, thus leading to improved cognitive and sensory processes.

Explanatory Feedback as a Driver for Deeper Understanding

In contrast to community-engagement feedback, which is characterized by the capacity to articulate the reasons for committing errors and correct approach, explanatory feedback has a unique ability and has thus become a significant instrument in enhancing learners' comprehension and metacognition. Such kind of feedback goes beyond simple correction. It provides insights into the "why" and "how" of mistakes, thus contributing to a better understanding of the problem and its correction process. Based on the opinion of Teng (2024), learning that focuses on the cognitive process underlying the process of task performance can substantially help to rise to the achievement level, and therefore encourages the understanding of the strategies essential for self-regulating learning. This is more pronounced when the topic is on dyslexia because they benefit from the transparency of language system that helps them understand the rules and structures that sometimes seem incongruous or arbitrary (Elliott, 2020).

Dyslexic students with their learning challenges that mostly come from phonological processing and decoding difficulties (Snowling et al., 2020) are the ones who benefit the most from explanatory feedback that helps them to understand the ambiguous or complex information. Research works like that of Fiorella (2023), for example, stress the importance of adjusting the feedback paid to learners so misconceptions are effectively clarified and clear pictures of the correct topics are painted in the minds of learners. Instead of focusing on the language mechanisms and reading procedures that help dyslexic students develop stronger independent thinking strategies in overcoming their learning difficulties, explanatory feedback is supposed to function as a cognitive approach that enhances their reading comprehension and boosts their writing skills.

In addition, explanatory feedback is a vital part of metacognition as it inspires the students to think about their learning processes, assess their understanding, and plan their future learning activities. This self – reflection is supported by a study from Mason et al. (2022), who is saying feedback to growth mindset may help students to see difficulties as chances to learn and improve and challenges not insurmountable obstacles. Specifically, for dyslexia, this feedback can be really transforming as this can make the students perceive learning disabilities not as something that cannot be fixed but a condition that can be handled if it is understood and managed as per the proper strategies on how to deal with it (Yeager & Dweck, 2020).

Integrating Feedback in Multisensory Instruction

Feedback should be incorporated into the frame of multisensory instruction, which is the most effective way to meet the various needs of dyslexic learners, especially those who are in a second language environment. This multi-sensory instruction makes accessible for the needs of students with dyslexia as visual, auditory and kinesthetic-tactile activities is able to engage multiple senses to boost memory and learning process (Alsobhi & Alyoubi, 2020). While each technique alone boosts the learning likelihood, their combination together with feedback tightens the learning efficacy net by delivering immediate correction and clarification based on the sensory technique that is applicable.

The feedback is integrated in multisensory environments which enhances the learning of sensing, validating and correcting the neurological pathways in learning. As per the concept stated by Schams and Seitz (2008), multiple senses learning is often dependent on the feedbacks given by the consistency and the relevance that is based on the multiple senses learning given. Quick feedback on mistakes can be given by the audio medium through instant correction of pronunciation errors, which may enhance the phonetic process and make it more beneficial for dyslexic people (Semonská, 2022). Besides, the visual feedback via corrective demonstrations could be of great help in matching the visual perception with the verbal understanding, which is the main task in reading and comprehension.

The other essential factor to consider is task complexity as well as the context dependent need to give the students time to make sense of the additional sensory stimulation so as to avoid cognitive overload. According to Sweller (Learning theory: Cognitive Load), the provision of excessive or incorrect feedback at inappropriate times is among the causes of cognitive load increase, which inhibits learning (Skulmowski & Xu 2022). The timing and volume of feedback given by the teachers should be just right to be beneficial to the cognitive processing. This is essential in dealing with dyslexic study because such students take long to understand or process the information and this is attributed to their learning disabilities (Knoop-van Campen et al., 2020).

Teachers apply some methods that make timely feedback associated with particular multisensory techniques. As an example, if a teacher needs to teach a new vocabulary word, the teacher would do a tactile activity such as letting students trace letters with their fingers while pronouncing them to them along with a context form of usage in the conversation. Visual feedback could be illustrations or a whiteboard, where you can point to word structures or grammatical rules. Interactive and integrated feedback is a tool which may be utilised sequentially and simultaneously so that: feedback allows for assimilation while being specific and supportive of the multisensory process.

6. Conclusion and Recommendations

The present research expressed the significance of providing positive, specific and immediate feedback to enhance multisensory instruction for dyslexic English language learners, resulting in improved academic achievement in reading fluency, comprehension and phonemic awareness. The study showed that the focused feedback in multi-sensory environments was more effective for younger learners, thus, the need to align the feedback with the developmental stages and sensory needs of the students. Educational implications involve the development of instant but customized feedback methods in online learning and professional development programs, especially those dealing with special education and language acquisition. The scope of further investigation ought to encompass long-term outcomes of such instructional strategies and should also assess how different sensory modalities interact in order to provide enhanced teaching strategies for various student populations. This study proves the importance of particular, immediate feedback in education, and it promotes a balanced approach that takes into account the unique cognitive and sensory processing problems of dyslexic learners.

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Authors' contributions

Wafa' A. Hazaymeh and Turky Alshaikhi carried out the experiment. Mohammad Osman Abdul Wahab wrote the manuscript with support from Mohamad A. Khasawneh, Turky Alshaikhi and Wafa' A. Hazaymeh. Turky Alshaikhi helped supervise the project.

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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