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Discussion on the Role of AI-supported Feedback in Self-regulated Learning of SEN Students in Secondary Vocational Schools

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Abstract: Students with special needs in secondary vocational education commonly struggle with maintaining attention and exhibit relatively underdeveloped metacognitive and self-assessment skills. This study leverages a campus-based digital teaching platform to establish an AI-supported feedback mechanism, alleviating teaching pressures caused by insufficient faculty and class hours, and developing a formative assessment framework for special learners that features low cognitive load and covers the entire learning process. The research team conducted in-depth fieldwork in special education classrooms and training venues at vocational schools, collected firsthand data, analyzed real-world challenges in students' independent learning through classroom observations, explored feasible pathways for integrating AI feedback systems into special education curricula, and clarified potential ethical constraints and application boundaries during implementation. Field research findings indicate that introducing this feedback system into cultural courses and practical training classes helps stabilize learners' engagement, gradually fosters self-monitoring habits, and enables flexible adjustments of learning strategies. The practical insights gained from this study can serve as a reference for digital teaching reform in special education within China's secondary vocational education system.

Keywords: AI-assisted Feedback, Special Education in Secondary Vocational Schools, Independent Study, Formative Evaluation, Digitalized Teaching.

1. Introduction

Special education in secondary vocational schools focuses on vocational skills training for students with hearing impairments, mild intellectual disabilities, and autism spectrum disorders. Practical operation exercises are the core content of the curriculum, and teaching also takes into account the cultivation of learners' social adaptability. Within the same class, individual differences among learners are quite prominent [1]. The type of disability, the knowledge foundation accumulated before enrollment, and the long-term learning habits all lead to significant differences in learning outcomes. Classroom evaluations mainly adopt on-the-spot oral comments and post-class paper-based homework corrections. The class size and total class hours are subject to objective constraints, making it difficult for teachers to continuously follow the learning dynamics of each special learner and to carry out frequent and targeted learning guidance over a long period.

When learners engage in after-class self-practice or practical operations, it is difficult to identify subtle deviations in the operation details, and the available intervention measures to adjust the learning pace are relatively limited. Repeated encounters with learning setbacks will gradually deplete the learners' intrinsic learning motivation. The cultivation of autonomous learning ability requires the implementation of basic tasks such as setting phased goals, tracking learning progress, and evaluating learning outcomes [2]. Special education learners in secondary vocational schools have unique cognitive characteristics, and continuously monitoring their individual learning status poses certain difficulties for this group. With the gradual implementation of digital infrastructure on campus, AI supportive feedback has begun to be applied in special education classrooms. This mechanism does not merely determine the correctness of answers but relies on guiding strategies and positive incentives to embed prompts and correction content throughout the learning process, reducing the negative evaluation-induced frustration experience. By reviewing domestic published literature, it can be seen that the existing research samples mostly select ordinary primary and secondary school students, and the empirical results for special education learners in secondary vocational schools are relatively limited. Based on this research gap, this paper selects two types of classrooms, namely cultural courses and professional practical training, for on-site observation [3]. Combined with classroom records, it analyzes the value of AI supportive feedback in cultivating the autonomous learning literacy of special learners, providing practical ideas for frontline special education teachers to promote digital teaching.

2. The Practical Difficulties Faced by Vocational Secondary School Special Education Learners in Their Autonomous Learning Process

Individual differences are the most prominent characteristic of the vocational special education group. Multiple real factors interact with each other and continuously influence the autonomous learning behaviors of learners in cultural courses and practical training courses. Many learners have not yet established a stable self-assessment method, and their ability to independently judge learning effectiveness is relatively weak [4]. When learners judge the quality of their learning, they mostly rely on the external evaluations provided by teachers, and have insufficient awareness of actively reviewing their learning process. Preparing lessons,

providing practical guidance, and writing individualized education plans consume a large amount of teachers' work energy, making it difficult for them to continuously track the practice status of learners after class and at the training stations [5].

When learners encounter difficulties during after-class practice or practical operation sessions, if they cannot obtain timely guidance, their learning activities are prone to be interrupted. Some learners have a high sensitivity to emotions, and direct criticism from teachers can easily trigger resistance, reducing the willingness of learners to participate in autonomous practice. Such real problems that have persisted in the classroom for a long time have restricted the regular implementation of autonomous learning behaviors of vocational special education learners, while creating practical conditions for the entry of digital feedback tools into the classroom [6]. Exploring intelligent feedback intervention methods can provide a feasible direction for improving the quality of autonomous learning for special learners.

3. The Supportive Feedback Provided by AI Drives the Intrinsic Path of Autonomous Learning

3.1. Immediate Feedback Inhibits the Solidification of Erroneous Cognition

The traditional manual grading mode inherently has a time delay. After learners complete written exercises or practical tasks, the graded materials and operation records are uniformly submitted to the teacher for review. During the waiting period for feedback, the errors and non-standard operation habits formed by learners during the practice stage will gradually become fixed, and the difficulty of subsequent correction will increase [7].

After learners submit their homework online and complete virtual skill simulation operations, the AI supportive feedback system quickly generates evaluation information. The system automatically checks the answers and operation information, locates the specific where the problems occur, and simultaneously outputs feasible improvement plans. Learners can promptly identify omissions and correct their operations, reducing the retention of bad learning habits over time. The immediate feedback compensates for the time-limited shortcomings of manual grading and avoids the continuous deepening of incorrect cognition [8].

3.2. Personalized Feedback Matches the Learners' Differentiated Ability Levels

Special education students in secondary vocational schools exhibit significant individual differences in terms of disability type, admission foundation, and comprehension speed. A single evaluation standard is insufficient to meet the development needs of different learners. The AI system continuously collects long-term learning behavior data from learners and dynamically adjusts the feedback content based on their individual learning status [9]. For learners with weak foundations, the feedback content is simplified in presentation form, focusing on providing positive incentives for the learning process; for those with outstanding performance, supplementary learning prompts are provided.

The differentiated feedback model can avoid the adaptation problems brought about by a uniform evaluation, aligning with Vygotsky's theory of the Zone of Proximal Development, and ensuring that the evaluation support matches the current development level of learners. Based on this mechanism, learners at different ability levels can obtain learning support that is tailored to their own conditions, alleviating the limitations inherent in standardized evaluations [10].

3.3. Low-pressure Feedback Maintains Learners' Intrinsic Learning Motivation

Many special education learners possess emotional sensitivity. Publicly negative evaluations will gradually deplete their intrinsic learning motivation. AI feedback is automatically pushed by the system, and learners do not have to bear the psychological burden of face-to-face evaluations. The feedback content is mainly positive, and sharp judgments are avoided as much as possible. Optimized suggestions are prioritized for the learning segments completed by learners with better quality. Learners can repeatedly engage in trial-and-error practice, and their willingness to participate in autonomous learning tasks simultaneously increases [11]. The low-pressure evaluation environment is suitable for the psychological characteristics of special learners, maintaining stable learning engagement and reducing the behavior of learners avoiding practice due to fear of making mistakes.

4. Process-based Feedback Shapes Self-monitoring Learning Competence

The AI system continuously collects multi-dimensional learning data such as practice duration, operation steps, and error types. Evaluation is no longer limited to the final results corresponding to a single task. The system will provide periodic prompts during the entire learning cycle to guide learners to review the entire learning process [12]. Long-term use of this digital tool enables learners to access their personal learning archives, intuitively perceive their own growth and changes, and gradually build basic self-monitoring abilities.

Self-monitoring is a core component of autonomous learning literacy and is also a key area to focus on during the cultivation stage of autonomous learning. Relying on continuous process feedback, learners can gradually examine their own learning behaviors and master the methods of autonomously adjusting their learning progress [13].

5. The Implementation Constraints of AI Supportive Feedback in Special Education Classes at Secondary Vocational Schools

The application of digital teaching tools cannot be separated from the actual conditions of special education classrooms. The technology itself only serves as an auxiliary means, and there are multiple constraints at multiple implementation levels [14]. Hardware equipment and network environment are the basic prerequisites. Some training classrooms have outdated equipment and unstable network signals, which will cause feedback loading delays and data loss, directly affecting the effectiveness of AI-supported feedback. The uneven informatization construction of different campuses also widens the gap in digital teaching practices among schools.

The digital literacy of learners themselves also constitutes a constraint. Some special learners have limited opportunities to use intelligent devices and insufficient basic operational skills, requiring teachers to invest additional time in

conducting operation training [15]. If learners cannot operate the system proficiently, it will be difficult for them to fully receive feedback information, and the goal of enabling autonomous learning through technology will be greatly undermined.

The professional ability of teachers is also not to be ignored. The use of AI feedback systems requires special education teachers to master basic data interpretation methods and be able to interpret the learning data generated by the system in combination with individualized education plans. Teachers need to distinguish the boundaries between system feedback and classroom manual guidance and cannot rely solely on the system to judge students' learning situations. Technology cannot replace the humanistic care and professional judgment of special education teachers, which is also a key point that needs to be continuously focused on during the digital transformation of special education [16]. The supporting work such as equipment operation, system updates, and data security management also requires schools to establish a regular management mechanism to ensure the stability and safety of the application process.

6. The Evaluation Approach for the Application Effect of AI Supportive Feedback

Regarding the practical effect of AI-supported feedback in special education classes in secondary vocational schools, it cannot be judged solely based on a single academic performance indicator [17]. A multi-dimensional assessment framework needs to be established, taking into account both the process performance and the long-term changes in students' abilities. Traditional evaluations often rely on training assessment scores as the core basis. Such result-oriented indicators are difficult to capture changes in soft qualities such as learners' self-study habits and self-reflection abilities. This study divides the assessment dimensions into three levels: learning behavior, cognitive ability, and emotional attitude [18]. The learning behavior dimension focuses on recording the frequency of learners' self-practice, self-checking frequency, and the continuity of task completion; the cognitive level focuses on examining the learners' metacognitive level and determining whether students can independently identify learning gaps; the emotional level focuses on observing the emotional reactions of learners when facing learning failures and measuring changes in their intrinsic learning motivation.

The assessment implementation period needs to be extended. Short-term tests are prone to result deviations. Special learners' ability improvement speeds are relatively slow, and ability changes often require continuous months of teaching intervention [19]. During the data collection stage, in addition to the learning logs automatically retained by the system, teachers' classroom observation records, and short interviews should also be included in the assessment materials to achieve complementarity between quantitative data and qualitative data. The purpose of using the assessment results is not to rank learners as superior or inferior, but to reverse-engineer AI feedback strategies and classroom teaching designs. After the assessment is completed, teachers can adjust individualized education plans based on the assessment data and dynamically modify the intensity and frequency of system feedback [20]. This assessment approach weakens the assessment and screening functions, highlights the diagnostic and improvement value, and is in line with the basic orientation of special education, which is people-oriented.

7. Conclusion

Special education in secondary vocational schools sets two core training goals: imparting the necessary vocational skills required by the position and cultivating the learners' autonomous learning ability, ultimately shaping comprehensive qualities that are suitable for the job requirements. AI supportive feedback is a digital teaching auxiliary tool with features of immediate response, personalization, and low psychological load. This tool can make up for the shortcomings of traditional classroom feedback and help special education learners gradually establish an awareness of autonomous learning.

In real teaching scenarios, teachers need to clearly define the auxiliary role of AI, integrating AI feedback, humanistic care, and individualized education plans. During the teaching assistance carried out through technology, teachers should adhere to the basic concept of special education that is people-oriented, continuously optimize the autonomous learning implementation plan, and assist secondary vocational special education learners in completing the transition from campus learning to job placement. Subsequent research can track the actual effect after the technology is implemented and gradually improve the application norms of this tool in special education classrooms.

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