

Environment-Based Teaching Factory Learning through Modified Cassava Flour Production for Students with Mild Intellectual Disabilities

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ABSTRACT

Vocational education for students with mild intellectual disabilities requires contextual learning that accommodates their individual abilities and support needs. This study explored the implementation of environment-based teaching factory learning through modified cassava flour (MOCAF) production, focusing on instructional practices, family involvement, school support, and implementation challenges. A qualitative case study was conducted at a special school in Indonesia, involving one student with mild intellectual disabilities, the student's mother, a vocational teacher, and the school principal. Data were collected through observations, semi-structured interviews, and document analysis. Data analysis followed the interactive model of Miles et al., incorporating data condensation, display, and conclusion drawing, with source and method triangulation to strengthen credibility. MOCAF production provided structured vocational activities involving sequential production procedures. Repeated demonstrations, visual guidance, and practical exercises appeared to facilitate student participation, although assistance remained necessary during tasks requiring precision and procedural consistency. Family involvement primarily consisted of supervision, encouragement, and emotional support, while school support included assessment, instructional materials, facilities, and teacher guidance. Major challenges included limited independent task performance, insufficient home-based practice opportunities, and restricted access to specialized vocational instructors. Environment-based teaching factory learning through MOCAF production offers a contextual approach to vocational education for students with mild intellectual disabilities. The findings highlight the importance of coordinated family-school support and individualized instruction while emphasizing the context-specific nature of single-case evidence.

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1. INTRODUCTION

Education supports the development of independent living skills and social participation among students with special educational needs (Esteban, 2022; Mohd Kamil et al., 2023). One group that requires continuous educational support is students with mild intellectual disabilities. These students experience limitations in intellectual functioning and adaptive behavior that emerge during the developmental period and affect conceptual, social, and practical skills in everyday life (Gravr  kmo et al., 2023). Such limitations may affect communication, social interaction, problem-solving abilities, and independent functioning. Nevertheless, previous studies have shown that students with mild intellectual disabilities can develop practical and vocational skills through learning experiences that align with their characteristics and educational needs (Almalky & Alqahtani, 2025; Pristiwaluyo, 2017). Educational services for this group should therefore address not only academic achievement but also the development of competencies that support independent living and social participation after completing formal education (Lombardi et al., 2018).

Vocational education is one form of educational provision that supports the development of these competencies. In addition to preparing students for employment, vocational education contributes to the development of life skills required for daily living (Zambri et al., 2023). Vocational programs have been associated with work readiness, employability, independence, and successful transitions to adulthood among students with intellectual disabilities (Husni & Min, 2023; Othman et al., 2025). Achieving these outcomes requires learning experiences that enable students to engage in activities connected to real-life situations (Co  noman et al., 2024; Ineland et al., 2021). Such engagement provides opportunities for students to learn work procedures, develop responsibility, and acquire practical skills that can be applied across various life contexts (Shoemaker, 2020).

The development of vocational skills requires instructional approaches that connect learning processes with work experiences. One approach widely used in vocational education is work-based learning (Morris, 2018). This approach places workplace experiences at the center of learning by engaging students in activities that resemble authentic work situations (Amarathunga, 2024). One form of work-based learning is the teaching factory approach, which integrates instructional activities with authentic production processes (Pratama et al., 2025). Through teaching factory activities, students learn specific vocational skills while gaining an understanding of how work is planned, implemented, and evaluated within a production system. These experiences provide opportunities for students to perform tasks, follow work procedures, and complete activities in a structured and sequential manner (Fergusson, 2022).

The implementation of teaching factory can be strengthened through environment-based vocational learning that utilizes local resources and community potential as learning media (Cruz et al., 2018; Hakeem et al., 2024). This approach connects learning activities with contexts that are familiar to students, allowing the skills being learned to relate more closely to their everyday environments (Cruz et al., 2018). The use of local resources also enables practical activities to be combined with learning experiences that resemble real workplace situations (Amarathunga, 2024). For students with mild intellectual disabilities, concrete and structured learning experiences are important for supporting skill acquisition and task understanding (Akdemir & Karaaslan, 2025; Kantathanawat et al., 2025). The integration of teaching factory and environment-based vocational learning creates opportunities for students to engage in authentic production activities that are connected to their daily experiences and local environment (Maksum et al., 2023; Rohaeni et al., 2021).

One local resource that can be utilized in environment-based vocational learning is cassava, which can be processed into modified cassava flour (MOCAF). This study implemented an environment-based teaching factory program through MOCAF production activities. MOCAF was selected because its raw material is readily available within the local community and its production process consists of clear and sequential stages, including peeling, washing, cutting, fermentation, drying, milling, and packaging (Khasanah et al., 2024). These characteristics enable students to learn work procedures through structured and step-by-step activities. MOCAF production can also be conducted on a small scale, making it suitable for implementation in special school settings (Widyastuti et al., 2024). In addition to its economic value,

MOCAF production provides opportunities for students to engage in productive activities related to work skills, entrepreneurship, and daily living skills. The activity also offers a learning context that allows students to participate directly in production processes that are relevant to everyday life and work-related experiences.

The implementation of MOCAF production activities is influenced not only by instructional design but also by the support available within the students' surrounding environment (Dzhugudzha et al., 2025; Georgiadou et al., 2022). Bronfenbrenner's ecological perspective explains that individual development is shaped through interactions between individuals and the environments in which they participate (Bronfenbrenner, 1979). Within vocational learning contexts, family involvement, school support, instructors, and learning facilities form interconnected support systems. Schools provide learning programs, opportunities for practical training, and instructional resources, while instructors guide students throughout the skill acquisition process. Learning experiences gained at school can be reinforced through family involvement, including encouragement and supervision at home (Tournier et al., 2021). The availability of adequate facilities supports the implementation of practical activities and facilitates continuity between instruction, practice, and support. The interaction among these factors contributes to students' vocational participation (Rooney-Kron & Dymond, 2022).

Although teaching factory approaches have been widely discussed in vocational education, limited research has examined how local-resource-based teaching factory activities can be adapted for students with mild intellectual disabilities in special school contexts. Existing studies have primarily addressed vocational education, work-based learning, teaching factory implementation, or family-school collaboration as separate areas of inquiry. Research that integrates the learning characteristics of students with mild intellectual disabilities, the use of local resources as production media, and the implementation of teaching factory programs in special school settings remains relatively limited. Studies investigating the relationships among instructional practices, family involvement, school support, and production-based learning activities are also scarce. Therefore, this study aimed to examine the implementation of an environment-based teaching factory program through MOCAF production activities for students with mild intellectual disabilities. Specifically, the study addressed three research questions: (1) How is an environment-based teaching factory program implemented through MOCAF production activities? (2) What roles do family involvement and school support play in the implementation of the program? and (3) What challenges emerge during the implementation of the program?

2. METHODS

A qualitative case study design was adopted to examine the implementation of an environment-based teaching factory program through modified cassava flour (MOCAF) production activities for a student with mild intellectual disabilities. Case study research enables an in-depth exploration of a phenomenon within its natural setting and is particularly suitable when the boundaries between the phenomenon and its context are not clearly separated (Baxter & Jack, 2015; White & Cooper, 2022). Attention was directed toward three interrelated aspects of the program, namely its implementation, the contribution of family involvement and school support, and the challenges that emerged throughout the learning process.

The research took place at SLB Satria Galdin in Bandung Regency, West Java, Indonesia. The school provides educational services for students with special educational needs through academic instruction, independent living training, character development, and vocational education. Among several vocational programs offered by the school, MOCAF production has been implemented since 2022 as part of skill development and independent living instruction. Cassava, which is readily available in the surrounding community, serves as the primary resource for production activities and forms the basis of the environment-based teaching factory program examined in this study.

Four participants were involved in the study: a student with mild intellectual disabilities, the student's mother, a teacher responsible for vocational learning activities, and the school principal. The student was 18 years old, enrolled in Grade XII, and had participated in vocational learning activities

and MOCAF production for approximately two years. Involvement in the production process covered all stages, from raw material preparation to packaging, with responsibilities adjusted to the student's abilities and support needs. The mother contributed perspectives related to home-based support and daily supervision. The teacher provided information regarding instructional practices, student participation, and challenges encountered during the implementation of the program. The school principal provided information concerning the planning, management, and implementation of vocational education programs.

Participant selection followed a purposive sampling strategy because the study required individuals who possessed direct experience with the program under investigation (Ahmad & Wilkins, 2025; Rai & Thapa, 2015). Consistent participation in MOCAF production activities was the primary consideration in selecting the student participant. The inclusion of the parent, teacher, and school principal was intended to provide complementary perspectives on family involvement, instructional practices, and institutional support. To protect confidentiality, participant codes were assigned throughout the reporting process. The student is referred to as S, the parent as P, the teacher as T, and the school principal as KS.

Information was gathered through observations, semi-structured interviews, and document analysis. MOCAF production activities provided the primary setting for observation and included peeling, washing, cutting, fermentation, drying, milling, and packaging. Particular attention was given to student participation, task completion, adherence to work procedures, communication during activities, and levels of independence. Semi-structured interviews offered opportunities to explore participants' experiences while maintaining sufficient flexibility for follow-up questions and clarification (Barriball & While, 1994; Dolczewski, 2022). Interviews were conducted with the student, parent, teacher, and school principal. Discussion topics included program implementation, family involvement, school support, instructional practices, and challenges encountered during participation in the program.

Additional evidence was obtained from documentary sources. These included vocational learning modules, student assessment records, photographs of MOCAF production activities, and school documents related to vocational education programs. Documentary materials were reviewed to provide contextual information and to support the interpretation of data obtained from observations and interviews (Morgan, 2022). The combination of multiple data sources allowed the phenomenon to be examined from different perspectives.

Analysis followed the interactive model proposed by Miles et al. (2014). The process involved reducing, organizing, and displaying the data before drawing and verifying conclusions. Coding was conducted across observation notes, interview transcripts, and documentary materials to identify recurring patterns relevant to the research questions. Emerging findings were subsequently organized into themes concerning program implementation, student participation, family involvement, school support, and implementation challenges. Credibility was strengthened through source and method triangulation by comparing information across participants and data collection techniques.

3. FINDINGS AND DISCUSSION

3.1 Findings

The findings were derived from observations, semi-structured interviews, and document analysis. Data analysis generated three major themes related to the implementation of an environment-based teaching factory program through *modified cassava flour* (MOCAF) production, the roles of family involvement and school support in program implementation, and the challenges that emerged during the implementation process.

3.1.1 Implementation of the Environment-Based Teaching Factory Program through MOCAF Production

The program was implemented through MOCAF production activities that utilized cassava as a locally available resource within the surrounding community. The learning activities involved peeling, washing, cutting, fermenting, drying, milling, sieving, and packaging. These activities served as a vocational learning context in which production processes formed an integral part of students' learning experiences.

Observation data indicated that the student (S) participated in all stages of production. However, the level of independence demonstrated varied across activities. S still required assistance during starter preparation for fermentation. During the washing stage, S was not always able to clean the cassava adequately without supervision. Difficulties were also observed during peeling, as portions of the cassava skin occasionally remained and required correction from the teacher. Similar challenges appeared during the cutting process because the size of the cassava pieces was not always consistent. In addition, S tended to wait for instructions before initiating subsequent tasks and still required guidance to maintain procedural consistency throughout the production process. These observations suggest that participation was not demonstrated uniformly across all stages of production.

A different pattern emerged during activities that had been practiced repeatedly. During the drying, sieving, and packaging stages, S appeared to follow instructions more consistently than during the earlier stages of production. In several instances, S required less prompting to complete familiar tasks. This observation was also reflected in the teacher's account. T explained that repeated demonstrations and practice helped the student become more familiar with work procedures. As T noted, *"When activities are repeated several times, the student becomes more familiar with the sequence of steps and requires fewer reminders during some stages"* (T). Interview findings further supported these observations. KS explained that vocational instruction at the school emphasizes direct practice rather than theoretical explanation. According to KS, *"Students usually understand activities more easily when they practice them directly rather than only receiving verbal explanations"* (KS). KS further explained that learning activities are implemented gradually and adjusted to each student's abilities. Throughout the learning process, teachers employed demonstrations, visual materials, and instructional modules to support students' understanding of work procedures.

Documentary evidence showed that each stage of MOCAF production was implemented sequentially according to established production procedures. Photographs documented S's participation across multiple stages of production, while instructional modules indicated that practical activities were designed to follow an authentic production workflow. Overall, the findings indicate that the environment-based teaching factory program was implemented through students' direct involvement in the complete MOCAF production process. Nevertheless, participation did not appear to be consistent across all activities. Tasks that were concrete and repeatedly practiced appeared easier for S to follow than tasks requiring precision and procedural consistency. This pattern suggests that direct involvement in production activities provided opportunities for S to gradually recognize and follow work procedures.

3.1.2 The Roles of Family Involvement and School Support

Family Involvement

Interview findings indicated that the family served as a primary source of support throughout the student's participation in the vocational program. The parent (P) was actively involved in supervising daily activities and encouraging the student to participate consistently in school-based learning activities. P explained that although independence was an important expectation, direct assistance remained common in everyday situations. As P stated, *"I do not place excessive demands on my child to be independent, but I always hope that he can become more independent"* (P). P also explained that concerns about safety influenced the level of supervision provided. Observation findings similarly showed that

many of the student's daily activities continued to be conducted under parental supervision, suggesting that parental support remained a significant component of the student's experiences outside school.

At the same time, P expressed positive views toward the MOCAF program implemented by the school. P stated, *"I will always support activities that can help develop my child's abilities"* (P). P further explained that participation in vocational activities provided the student with new experiences related to productive work. However, opportunities to continue MOCAF-related practice at home remained limited. According to P, *"At the moment, we have not continued the activities at home because of limitations in both ability and equipment"* (P). These findings indicate that family involvement was primarily expressed through supervision, motivation, and emotional support. Opportunities for direct vocational practice at home were comparatively limited. This pattern suggests that family support contributed more to sustaining the student's engagement in the program than to extending vocational practice beyond the school setting.

School Support

The school provided several forms of support to facilitate the implementation of the teaching factory program. These supports included assessment procedures, practice facilities, instructional resources, and guidance throughout learning activities. KS explained that the school employed a staged assessment system consisting of initial, formative, and summative assessments to monitor students' progress. Initial assessments were used to identify students' baseline abilities, formative assessments monitored learning progress during implementation, and summative assessments were used to review students' achievements following participation in the program. In addition, the school provided facilities that supported vocational learning activities. KS stated, *"There is a multipurpose room that is used for various vocational activities"* (KS). School documentation further showed that MOCAF production activities were conducted using facilities and equipment available within the school environment.

School support extended beyond the provision of physical resources. Observations showed that teachers demonstrated procedures before students engaged in practical activities and provided guidance when difficulties arose during particular stages of production. T explained that demonstrations were intentionally provided before each practical activity to help students understand the sequence of work procedures. As T stated, *"We usually demonstrate each step first and then guide the student during practice because some procedures are easier to understand when they are shown directly"* (T). The school also developed instructional modules aligned with the Learning Outcomes of the Merdeka Curriculum and adapted them to students' learning needs. KS explained that the school continuously sought to maximize available facilities so that vocational activities could be maintained. The findings indicate that school support encompassed assessment procedures, facilities, instructional resources, and ongoing instructional guidance throughout implementation. Together, these forms of support appeared to create conditions that enabled students to participate in structured production activities within the vocational learning environment.

3.1.3 Challenges in Program Implementation

Several challenges emerged during the implementation of the program. The first challenge was associated with the student's learning characteristics. Observation findings showed that S continued to require assistance during production stages that demanded precision and procedural consistency, particularly during fermentation, washing, peeling, and cutting activities. Initiative in beginning tasks also appeared limited during some activities. A second challenge concerned the continuity of vocational practice outside school. Although the family expressed support for the program, opportunities to continue practicing at home remained limited. Constraints related to equipment availability and familiarity with the production process influenced the extent to which MOCAF activities could be continued beyond the school setting. This condition was reflected in P's statement that the activities had not been continued regularly at home because of limitations in both resources and capabilities.

Challenges were also identified at the school level. KS explained that the school did not yet have vocational specialists with expertise in specific skill areas. According to KS, “*At present, there are no specialized vocational experts available at the school*” (KS). KS further explained that vocational activities were primarily facilitated by the teachers currently employed by the school. Although the school had established vocational programs and provided relevant facilities, the limited availability of specialized personnel remained a challenge in the implementation of production-based learning activities. Overall, the findings suggest that implementation challenges emerged at multiple levels. Some challenges were associated with students’ need for support while carrying out work procedures, whereas others were related to opportunities for practice outside school and the availability of technical expertise within the school environment.

The three themes reveal connections among production-based learning activities, environmental support, and implementation challenges. MOCAF production provided a structured learning context that enabled the student to participate in multiple stages of an authentic production process. Student participation appeared to be supported by both family involvement and school support throughout the learning process. At the same time, the need for ongoing assistance, limited opportunities for practice at home, and constraints in specialized support remained evident during implementation. These findings suggest that the implementation of the environment-based teaching factory program was shaped by the interaction among production activities, family support, school support, and the learning conditions available within the educational environment.

3.1.4 Cross-Source Synthesis of Findings

The findings presented in the previous sections were derived from multiple sources of evidence, including observations, interviews, and documentation. Comparing these sources enabled the identification of patterns that appeared consistently across the case. Table 1 summarizes the cross-source synthesis of the findings and illustrates how evidence from different data sources converged to support the interpretation of program implementation, family involvement, school support, and implementation challenges.

Table 1. Cross-Source Synthesis of Findings

Theme	Evidence Across Data Sources	Synthesized Finding
Implementation of the environment-based teaching factory program	Observations, interviews, and documentation consistently showed student participation across all stages of MOCAF production, supported by demonstrations, direct practice, and structured learning materials.	Participation occurred throughout the production process, although the level of independence differed across activities.
Family involvement	Observations and interviews indicated that parental support was primarily expressed through supervision, encouragement, and daily assistance, while documentation reflected ongoing communication between parents and the school.	Family support mainly took the form of supervision, motivation, and emotional support, with limited opportunities for home-based vocational practice.
School support	Observations, interviews, and school documents showed the use of assessments, instructional resources, facilities, and teacher guidance during program implementation.	School support provided the organizational and instructional conditions necessary for sustaining vocational learning activities.
Implementation challenges	Evidence from all data sources indicated the need for assistance during several production stages, limited opportunities for practice at home, and constraints in specialized vocational support.	Challenges emerged at the student, family, and school levels.

The triangulation process revealed a generally consistent pattern across observations, interviews, and documentation. All three sources indicated that S participated in the MOCAF production process, although assistance remained necessary during several activities. Family involvement and school support appeared to facilitate participation, while limited opportunities for home-based practice and the absence of specialized vocational expertise emerged as continuing challenges. Taken together, the findings suggest that the implementation of the environment-based teaching factory program was shaped by the interaction among student participation, family support, school support, and the resources available within the learning environment.

3.2 Discussion

A central feature of the program was the use of MOCAF production as the basis for vocational learning activities. The student participated in a sequence of tasks that included peeling, washing, cutting, fermenting, drying, milling, sieving, and packaging cassava flour. Learning was organized around production processes rather than verbal instruction alone. Instead of separating instruction from practice, vocational procedures were introduced through direct participation in production activities. Cassava, which was readily available in the surrounding community, served as the primary resource for the program. Consequently, learning activities were closely connected to everyday production practices and local environmental conditions.

The implementation process reflected several characteristics commonly associated with teaching factory learning. Production activities functioned not only as the object of learning but also as the context in which learning occurred. Students were introduced to vocational procedures through authentic tasks rather than simulated exercises. The use of locally available resources further strengthened the connection between school-based learning and the surrounding environment. This characteristic is consistent with environment-based learning approaches that emphasize local resources and authentic experiences as important components of vocational learning (Muhammad et al., 2021). Similar observations have been reported in vocational education settings where participation in meaningful production activities enables learners to engage directly with work-related tasks and responsibilities (Mayombe, 2024).

The characteristics of MOCAF production may also help explain its suitability as a vocational learning medium. The production process consists of observable and sequential stages. Each stage can be demonstrated, practiced, and repeated. Such characteristics appeared to facilitate the organization of learning activities into manageable steps. This arrangement provided opportunities for students to observe procedures, perform tasks, and revisit activities across multiple sessions. In this regard, MOCAF functioned not merely as a production output but also as a medium through which vocational procedures and work routines could be introduced and practiced. A similar emphasis on production-based learning has been discussed in research examining teaching factory implementation in special education settings (Aprilia et al., 2025).

One pattern that became evident throughout the program was the importance of repeated demonstrations and visual guidance. Observation data showed that the student continued to require assistance during several production stages, particularly those involving procedural accuracy and consistency. At the same time, activities that had been practiced repeatedly seemed easier to follow than less familiar tasks. Demonstrations, visual supports, and gradual instruction offered concrete points of reference when the student was required to complete sequential work procedures. This interpretation is supported by Van Laarhoven et al. (2018), who found that visual prompting systems assisted individuals with intellectual disabilities in completing vocational tasks and following work procedures. Related evidence was reported by Sun and Brock (2025), who showed that visual forms of instruction supported engagement with employment-related skills by helping learners follow task sequences more independently. Kang and Chang (2019) likewise found that repeated engagement with structured activities supported the development of procedural routines among children with intellectual disabilities. Although the contexts differed, these studies highlight the value of visual

supports and repeated practice when learning involves sequential tasks. In the present study, such supports appeared to make work procedures more accessible and predictable. However, assistance remained necessary during several stages of production, indicating that participation should not be interpreted as evidence of independent performance or mastery.

Family support formed an important part of the conditions surrounding program implementation. Parents primarily contributed through supervision, encouragement, and emotional support. Opportunities to continue MOCAF-related activities at home remained limited, yet parental involvement appeared to help sustain participation in school-based vocational activities. Support was expressed through monitoring daily activities, maintaining communication with the school, and encouraging the student to engage in learning activities. Direct instruction of vocational skills at home was less evident. As a result, the family's contribution was reflected more clearly in maintaining participation than in extending vocational practice beyond school.

This pattern corresponds with research highlighting the role of parental involvement in supporting transition and vocational learning among students with intellectual disabilities. Hsieh et al. (2025) reported that parental involvement often includes encouragement, coordination, and ongoing support throughout the learning process. Kerubo and Makanya (2024) similarly found that family participation contributes to vocational preparation by helping learners remain engaged in training activities. Nevertheless, parents in the present study reported constraints related to resources and familiarity with production procedures. Comparable barriers have been documented among families of learners with intellectual disabilities, particularly when access to information, training, and specialized support is limited (Oranga et al., 2022). Alfawzan and Almulhim (2024) likewise emphasized the importance of coordinated support among families, schools, and service providers. Taken together, these observations suggest that family involvement functioned primarily as a source of continuity, encouragement, and supervision rather than direct vocational instruction.

The implementation process also relied heavily on support provided by the school. Assessment procedures, instructional modules, facilities, and teacher guidance created the structure necessary for vocational activities to be carried out. Teachers accompanied the student throughout the production process and adapted instruction to emerging learning needs. Such support created the conditions required for production activities to be conducted on a regular basis. Participation in production-based learning therefore depended not only on student engagement but also on the availability of instructional and organizational support within the school environment.

The importance of these supports has been emphasized in previous research on vocational learning for students with special educational needs. Björk-Åhman et al. (2021) noted that vocational participation is influenced by educational structures, available resources, and support systems within learning environments. A comparable pattern was evident in the present study, where MOCAF production activities relied on coordinated assessment procedures, instructional resources, facilities, and teacher guidance. At the same time, the school reported limited access to specialized vocational personnel. Similar concerns have been raised by Currier Kipping and Sheen (2022), who highlighted the importance of professional and specialized services in vocational preparation for individuals with intellectual disabilities. School support in this study was therefore reflected not only in instructional guidance but also in the organizational arrangements that enabled the program to operate.

Viewed through Bronfenbrenner's ecological perspective, participation cannot be attributed to a single source of support (Bronfenbrenner, 1994). Instead, participation emerged through interactions among instructional guidance, family involvement, and resources available within the learning environment. Communication between parents and teachers further contributed to continuity across settings. Earlier studies have similarly emphasized the importance of family-school collaboration in supporting students with intellectual disabilities during educational and transition-related activities (Talapatra et al., 2019). From an ecological standpoint, vocational participation can be understood as the result of relationships among multiple environments that surround the learner rather than as the product of classroom instruction alone.

The ecological perspective also provides a useful lens for understanding the challenges identified during implementation. Some challenges were associated with the student's need for continued assistance during activities requiring procedural accuracy and consistency. Other challenges arose from limited opportunities for home-based practice and restricted access to specialized vocational expertise. These conditions indicate that participation was influenced not only by learner characteristics but also by the availability of support across different environments. Similar combinations of facilitating and constraining factors have been reported in transition research involving adolescents with disabilities (Hui et al., 2026). Luecking and Wittenburg (2009) likewise argued that participation in vocational and transition programs is shaped by coordinated support across multiple settings. Rather than representing isolated barriers, the challenges identified in this study appeared to emerge from interactions between learner needs and environmental conditions surrounding the implementation process.

This study contributes to the literature by providing an account of how an environment-based teaching factory program was implemented through MOCAF production activities in a special school setting. Previous studies have frequently examined teaching factory implementation, vocational learning, family involvement, and school support as separate areas of inquiry. The present study offers a more integrated perspective by examining how these elements intersected within a local-resource-based vocational learning program involving a student with mild intellectual disabilities. By focusing on MOCAF production as an environment-based teaching factory activity, the study illustrates how production-based learning, instructional support, family involvement, school support, and implementation challenges interacted throughout the learning process. Nevertheless, the findings were derived from a single case and should therefore be interpreted within that context. The study also focused on implementation rather than long-term vocational outcomes. Further research involving multiple schools, a larger number of participants, and longer periods of observation would help clarify how environment-based teaching factory activities contribute to vocational development and school-to-work transitions over time.

4. CONCLUSION

This study examined the implementation of an environment-based teaching factory program through MOCAF production activities for a student with mild intellectual disabilities. The findings suggest that MOCAF production may provide a meaningful context for implementing environment-based teaching factory learning among students with mild intellectual disabilities. Within this learning context, repeated demonstrations, visual guidance, and opportunities for repeated practice appeared to support the student's participation in production activities. The study also found that family involvement contributed primarily through emotional support, encouragement, and supervision, while school support was reflected in the provision of assessment procedures, instructional modules, facilities, and teacher guidance that enabled the program to be implemented.

Taken together, the findings suggest that environment-based teaching factory learning through MOCAF production can provide contextual vocational learning experiences for students with mild intellectual disabilities. At the same time, the implementation process was influenced by several challenges, including the student's need for continued assistance during some production stages, limited opportunities for home-based practice, and restricted access to specialized vocational expertise. As a single-case qualitative study, the findings should be interpreted within the context of the participant and school involved. Future research could examine similar programs across multiple schools and participant groups, explore different forms of environment-based vocational learning, and investigate how such programs are implemented over longer periods of time.

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REFERENCES

- Ahmad, M., & Wilkins, S. (2025). Purposive sampling in qualitative research: a framework for the entire journey. *Quality & Quantity*, 59(2), 1461–1479. <https://doi.org/10.1007/s11135-024-02022-5>
- Akdemir, B., & Karaaslan, D. (2025). Effectiveness of simulation-based learning environment in teaching earthquake safety skills to students with intellectual disabilities. *International Journal of Developmental Disabilities*, 1–13. <https://doi.org/10.1080/20473869.2025.2589987>
- Alfawzan, S., & Almulhim, N. (2024). Barriers and facilitators to implementing transition services for students with intellectual disabilities in the kingdom of Saudi Arabia: A systematic review. *Journal of Intellectual Disabilities*. <https://doi.org/10.1177/17446295241301853>
- Almalky, H. A., & Alqahtani, S. M. (2025). Teachers' evaluation of vocational curriculum for secondary students with intellectual disabilities: An exploratory analysis from Saudi Arabia. *Research in Developmental Disabilities*, 165, 105100. <https://doi.org/10.1016/j.ridd.2025.105100>
- Amarathunga, B. (2024). Work integrated learning and trending areas for future studies: a systematic literature review and bibliometric analysis. *Asian Education and Development Studies*, 13(2), 97–116. <https://doi.org/10.1108/AEDS-12-2023-0175>
- Aprilia, I. D., Tarsidi, I., Rahmat, C., & Hernawati, T. (2025). Challenges and opportunities in implementing the teaching factory model in special needs schools: alternative work readiness for students with disabilities. *Journal of ICSAR*, 9(1), 1–8. <https://doi.org/10.17977/um005v9i12025p1-8>
- Barriball, L. K., & While, A. (1994). Collecting data using a semi-structured interview: a discussion paper. *Journal of Advanced Nursing*, 19(2), 328–335. <https://doi.org/10.1111/j.1365-2648.1994.tb01088.x>
- Baxter, P., & Jack, S. (2015). Qualitative case study methodology: study design and implementation for novice researchers. *The Qualitative Report*. <https://doi.org/10.46743/2160-3715/2008.1573>
- Björk-Åhman, C., Holmgren, R., Pettersson, G., & Ström, K. (2021). Nordic research on special needs education in upper secondary vocational education and training: A review. *Nordic Journal of Vocational Education and Training*, 11(1), 97–123. <https://doi.org/10.3384/njvet.2242-458X211197>
- Bronfenbrenner, U. (1994). Ecological models of human development. *International Encyclopedia of Education*, 3(2), 37–43.
- Coñoman, G. I., Ávila, V., & Carmona, C. (2024). Initiatives to support the school-to-work transition of people with intellectual disabilities: a systematic review. *Journal of Intellectual & Developmental Disability*, 49(4), 488–500. <https://doi.org/10.3109/13668250.2024.2317799>
- Cruz, A. R., Selby, S. T., & Durham, W. H. (2018). Place-based education for environmental behavior: a 'funds of knowledge' and social capital approach. *Environmental Education Research*, 24(5), 627–647. <https://doi.org/10.1080/13504622.2017.1311842>
- Currier Kipping, K. R., & Sheen, J. C. (2022). Role of Vocational Rehabilitation Counselors in Supporting Postsecondary Education for Students with Intellectual Disabilities. *Journal of Rehabilitation*, 88(3).
- Dolczewski, M. (2022). Semi-structured interview for self-esteem regulation research. *Acta Psychologica*, 228, 103642. <https://doi.org/10.1016/j.actpsy.2022.103642>
- Dzhugudzha, N., Uys, C., & Ramano, E. (2025). Current practices influencing school-to-work transition for learners with mild intellectual disability: A scoping review. *South African Journal of Education*, 45(2), 1–16. <https://doi.org/10.15700/saje.v45n2a2502>
- Esteban, M. B. (2022). Children's Participation, Progressive Autonomy, and Agency for Inclusive Education in Schools. *Social Inclusion*, 10(2). <https://doi.org/10.17645/si.v10i2.4936>

- Fergusson, L. (2022). Learning by... Knowledge and skills acquisition through work-based learning and research. *Journal of Work-Applied Management*, 14(2), 184–199. <https://doi.org/10.1108/JWAM-12-2021-0065>
- Georgiadou, I., Vlachou, A., & Stavroussi, P. (2022). Quality of life and vocational education service quality in students with intellectual disability. *International Journal of Developmental Disabilities*, 68(5), 681–691. <https://doi.org/10.1080/20473869.2021.1887435>
- Gravråkmo, S., Olsen, A., Lydersen, S., Ingul, J. M., Henry, L., & Øie, M. G. (2023). Associations between executive functions, intelligence and adaptive behaviour in children and adolescents with mild intellectual disability. *Journal of Intellectual Disabilities*, 27(3), 715–727. <https://doi.org/10.1177/17446295221095951>
- Hakeem, M. M., Goi, H. C., & Frendy, F. (2024). Leveraging place-based resources for quality education: insights from a forest community outreach project in Japan. *International Journal of Sustainability in Higher Education*, 25(5), 1066–1084. <https://doi.org/10.1108/IJSHE-09-2023-0398>
- Hsieh, Y., Ho, W., & Sun, S. (2025). Parent involvement in post-school transition services for senior high school students with intellectual disabilities. *Journal of Applied Research in Intellectual Disabilities*, 38(1). <https://doi.org/10.1111/jar.13316>
- Hui, A. N. N., Kwan, C. K., & Ip, P. S. Y. (2026). Facilitating and hindering factors for adolescents with disabilities transitioning from secondary to post-secondary education: an exploratory and retrospective study. *Adolescents*, 6(1), 5. <https://doi.org/10.3390/adolescents6010005>
- Husni, S. N. H., & Min, L. H. (2023). Challenges and opportunities in the school-to-work transition for students with special needs. *Journal of Contemporary Social Science and Education Studies 9JOCSSSES*, 3(1). <https://doi.org/10.5281/zenodo.14011062>
- Ineland, J., Karhina, K., & Vikström, L. (2021). School-to-work transitions for students with intellectual disabilities: teachers' perceptions and experiences of a recent workplace-based reform in Sweden. *Journal of International Special Needs Education*, 24(2), 86–96. <https://doi.org/10.9782/JISNE-D-20-00012>
- Kang, Y., & Chang, Y. (2019). Using a motion-controlled game to teach four elementary school children with intellectual disabilities to improve hand hygiene. *Journal of Applied Research in Intellectual Disabilities*, 32(4), 942–951. <https://doi.org/10.1111/jar.12587>
- Kantathanawat, T., Treearpornwong, A., & Charoentham, M. (2025). Development of a problem-solving ability learning model for children with intellectual disabilities. *Journal of Education and Health Promotion*, 14(1). https://doi.org/10.4103/jehp.jehp_13_25
- Kerubo, O. D., & Makanya, M. (2024). Parental involvement in training on the transitioning of learners with intellectual disability from school to employment in Nairobi City County, Kenya. *European Journal of Special Education Research*, 10(7). <https://doi.org/10.46827/ejse.v10i7.5636>
- Khasanah, Y., Anastasia Wheni Indrianingsih, Triwitono, P., & Agnes Murdiati. (2024). Production, biological activities and functional food of modified cassava flour (MOCAF). *Canrea Journal: Food Technology, Nutritions, and Culinary Journal*, 213–229. <https://doi.org/10.20956/canrea.v7i2.1280>
- Lombardi, A. R., Dougherty, S. M., & Monahan, J. (2018). Students with intellectual disabilities and career and technical education opportunities: a systematic literature review. *Journal of Disability Policy Studies*, 29(2), 82–96. <https://doi.org/10.1177/1044207318764863>
- Luecking, R. G., & Wittenburg, D. (2009). Providing supports to youth with disabilities transitioning to adulthood: case descriptions from the youth transition demonstration. *Journal of Vocational Rehabilitation*, 30(3), 241–251. <https://doi.org/10.3233/JVR-2009-0464>
- Maksum, H., Purwanto, W., Siman, S., Ampera, D., Yuvenda, D., & Hasan, H. (2023). Improving Problem-Solving and Communication Skills in Automotive Vocational Education through the Development of Teaching Factory Model with Problem-Based Learning (TEFA-PBL) Concept. *International Journal of Education in Mathematics, Science and Technology*, 12(2), 364–386. <https://doi.org/10.46328/ijemst.3941>

- Mayombe, C. (2024). Applying experiential learning theory in non-school-based technical and vocational education and training for unemployed youths in South Africa. *Journal of Education*, (96), 223–229. <https://doi.org/10.17159/2520-9868/i96a12>
- Miles, M. B., Huberman, A. Mi., & Saldafia, J. (2014). *Qualitative-Data-Analysis*.
- Mohd Kamil, N. K., Amin, A. S., Akhir, M., Badayai, A., Zambri, M., Sutan, R., Khairuddin, K. F., & Abdullah, W. (2023). Independent Living Skills Needed by Students with Special Educational Needs (SEN) Towards Inclusive Education: A Systematic Literature Review. *SPECIALUSIS UGDYMAS / SPECIAL EDUCATION*, 1(44).
- Morgan, H. (2022). Conducting a Qualitative Document Analysis. *The Qualitative Report*. <https://doi.org/10.46743/2160-3715/2022.5044>
- Morris, C. (2018). Work-based Learning. In *Understanding Medical Education* (pp. 163–177). Wiley. <https://doi.org/10.1002/9781119373780.ch12>
- Muhammad, H. A., Mohammed, J. U., Kanu, J. A., & Attaochu, E. U. (2021). Effect of place-based learning methods on students' achievement and interest in basic science and technology in Minna, Niger State. *International Journal of Vocational Education and Training*, 26(2), 8–20. <https://iveta.global/contact/>
- Oranga, J., Obuba, E., & Boinett, F. J. (2022). Barriers to parental involvement in the education of learners with intellectual disabilities. *Open Journal of Social Sciences*, 10(02), 410–423. <https://doi.org/10.4236/jss.2022.102029>
- Othman, N. N. J. N., Kamaruzaman, F. M., & Rasul, M. S. (2025). Determining job profile indicators and work capabilities of students with learning disabilities in food service industry: a scoping review. *2025 10th International STEM Education Conference (ISTEM-Ed)*, 1–6. <https://doi.org/10.1109/iSTEM-Ed65612.2025.11129343>
- Pratama, G. N. I. P., Triyono, M. B., Setiadi, B. R., Wibawa, E. A., Milansari, I. L., Dinata, C., & Prihandini, T. F. (2025). A systematic literature review on implementation of teaching factory model in vocational education. *WSEAS TRANSACTIONS ON BUSINESS AND ECONOMICS*, 22, 708–718. <https://doi.org/10.37394/23207.2025.22.62>
- Pristiwaluyo, T. (2017). Developing vocational skills for children of intellectual disabilities. *Proceedings of the 9th International Conference for Science Educators and Teachers (ICSET 2017)*. <https://doi.org/10.2991/icset-17.2017.84>
- Rai, N., & Thapa, B. (2015). A study on purposive sampling method in research. *Kathmandu School of Law Review*. <http://study.com/academy/lesson/what-is-sampling-in-research-definition-methods-importance.html>
- Rohaeni, E., Trisnamansyah, S., Wasliman, I., & Sauri, S. (2021). Implementation of teaching factory in improving the competence of vocational high school students (SMK). *Journal of Social Science*, 2(5), 598–609. <https://doi.org/10.46799/jss.v2i5.220>
- Rooney-Kron, M., & Dymond, S. K. (2022). Participation of students with intellectual disability in community-based work experiences: a scoping review. *Research and Practice for Persons with Severe Disabilities*, 47(2), 90–110. <https://doi.org/10.1177/15407969221093378>
- Shoemaker, L. E. (2020). *Abstract employment of individuals with intellectual disabilities: a case study of time management and job training skills*.
- Sun, X., & Brock, M. E. (2025). Empowering young adults with significant disabilities to learn new employment skills through self-directed video-based instruction. *Career Development and Transition for Exceptional Individuals*, 48(3), 201–211. <https://doi.org/10.1177/21651434241256297>
- Talapatra, D., Miller, G. E., & Schumacher-Martinez, R. (2019). Improving family-school collaboration in transition services for students with intellectual disabilities: a framework for school psychologists. *Journal of Educational and Psychological Consultation*, 29(3), 314–336. <https://doi.org/10.1080/10474412.2018.1495083>
- Tournier, T., Wolkorte, R., Hendriks, A. H. C., Jahoda, A., & Embregts, P. J. C. M. (2021). Family involvement in person-centered approaches for people with intellectual disabilities and

- challenging behaviors: a scoping review. *Journal of Mental Health Research in Intellectual Disabilities*, 14(4), 349–374. <https://doi.org/10.1080/19315864.2021.1959689>
- Van Laarhoven, T., Carreon, A., Bonneau, W., & Lagerhausen, A. (2018). Comparing mobile technologies for teaching vocational skills to individuals with autism spectrum disorders and/or intellectual disabilities using universally-designed prompting systems. *Journal of Autism and Developmental Disorders*, 48(7), 2516–2529. <https://doi.org/10.1007/s10803-018-3512-2>
- White, R. E., & Cooper, K. (2022). Case study research. in *qualitative research in the post-modern era* (pp. 233–285). Springer International Publishing. https://doi.org/10.1007/978-3-030-85124-8_7
- Widyastuti, R. C., Damayanti, A., Putri, D. A., Krisdayanti, S., & Ubay, I. N. (2024). *Community empowerment as initiator of micro, small, and medium enterprises (MSMES) in food processing through training in producing modified cassava flour (MOCAF) from cassava roots*. 9(1). <https://doi.org/10.25047/j-dinamika.v9i1.4418>
- Zambri, I. M., Amin, A. S., Mohd Kamil, N. K., Md Akhir, N., Sutan, R., Khairuddin, K. F., & Wan Abdullah, W. A. (2023). factor affecting independent living of persons with intellectual disabilities: a systematic review. *International Journal of Academic Research in Progressive Education and Development*, 12(1). <https://doi.org/10.6007/IJARPED/v12-i1/15811>