

**PENGEMBANGAN TEKNOLOGI ASISTIF BERBASIS
UNIVERSAL DESIGN FOR LEARNING UNTUK MENINGKATKAN
AKSESIBILITAS SISWA TUNARUNGU DI LINGKUNGAN
MULTIKULTURAL**

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ABSTRAK

Siswa tunarungu sering mengalami keterbatasan aksesibilitas dalam pembelajaran matematika karena media pembelajaran jarang mengakomodasi kebutuhan komunikasi dan karakteristik belajar visual mereka. Tantangan ini semakin terasa dalam lingkungan pendidikan multikultural, di mana media pembelajaran yang ada jarang mengintegrasikan dukungan bahasa isyarat dengan prinsip desain inklusif yang menjawab kebutuhan beragam siswa tunarungu. Penelitian ini bertujuan untuk mengembangkan teknologi asistif berbasis Universal Design for Learning (UDL) dalam bentuk website pembelajaran SIMATIKA yang valid dan praktis untuk mendukung aksesibilitas pembelajaran matematika bagi siswa tunarungu di lingkungan multikultural. Penelitian ini melibatkan dua ahli materi, dua ahli media, satu guru, dan lima siswa tunarungu. Penelitian ini menggunakan pendekatan Research and Development (R&D) dengan model ADDIE, yang dilaksanakan hingga tahap development, meliputi fase analysis, design, dan development. Data dikumpulkan melalui angket validitas dan angket respons pengguna, kemudian dianalisis menggunakan formula validitas isi Gregory dan analisis persentase. Website SIMATIKA dinilai sangat valid oleh ahli materi maupun ahli media, yang menegaskan kesesuaiannya dari segi ketepatan isi dan desain media, serta dinilai sangat praktis oleh guru dan siswa, yang mencerminkan kemudahan penggunaannya dan kemampuannya mendukung pembelajaran matematika yang aksesibel. Dapat disimpulkan bahwa teknologi asistif berbasis UDL yang dikembangkan valid dan praktis untuk mendukung aksesibilitas pembelajaran matematika bagi siswa tunarungu. Temuan ini mengimplikasikan bahwa website pembelajaran berbasis UDL dapat menjadi media pembelajaran inklusif yang mendorong pembelajaran matematika yang lebih aksesibel bagi siswa tunarungu di lingkungan pendidikan multikultural.

Kata kunci: *Universal Design for Learning (UDL); teknologi asistif; aksesibilitas pembelajaran; siswa tunarungu; pembelajaran Matematika.*

THE DEVELOPMENT OF ASSISTIVE TECHNOLOGY BASED ON UNIVERSAL DESIGN FOR LEARNING TO ENHANCE ACCESSIBILITY FOR DEAF STUDENTS IN A MULTICULTURAL ENVIRONMENT

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ABSTRACT

Deaf students often face limited accessibility in mathematics learning because instructional media rarely accommodate their communication needs and visual-based learning characteristics. This challenge is more pressing in multicultural educational settings, where existing learning media seldom integrate sign language support with inclusive design principles that address deaf learners' diverse needs. This study aimed to develop a Universal Design for Learning (UDL)-based assistive technology in the form of the SIMATIKA learning website that is valid and practical for supporting mathematics learning accessibility for deaf students in multicultural settings. The research involved two material experts, two media experts, one teacher, and five deaf students. This study employed a Research and Development (R&D) approach using the ADDIE model, conducted up to the development stage covering the analysis, design, and development phases. Data were collected through validity and user response questionnaires, analyzed using Gregory's content validity formula and percentage analysis. The SIMATIKA website was rated as highly valid by both material and media experts, confirming its appropriateness in content accuracy and media design, and was perceived as highly practical by the teacher and students, reflecting its ease of use and capacity to support accessible mathematics instruction. It is concluded that the developed UDL-based assistive technology is valid and practical for supporting mathematics learning accessibility for deaf students. The findings imply that a UDL-based learning website can serve as an inclusive instructional medium to promote more accessible mathematics learning for deaf students in multicultural educational settings.

Keywords: *Universal Design for Learning (UDL); assistive technology; learning accessibility; deaf or hard-of-hearing students; Mathematics learning.*