



**DigiEduHack Solution**  
**Eskişehir DigiEduHack 2019**  
**Challenge: AI and intelligent personal**  
**assistances for accessibility**

# **ABLE: Application for Beating Limitations in Education**

## **An 'Application for Beating Limitations in Education'**

ABLE (Application for Beating Limitations in Education) is a software system aiming to enable individuals with disabilities to experience the most effective interaction with their mobile devices (even PCs, laptops, etc.).

### **Team: Team 1**

#### **Team members**

Behiye Turan, Ozgur Dogan Yildiz, Huriye Akkas, Cahit Sahin, Ercan Sahin, Gulay Ilkan, Dr. Utku Kose

#### **Members roles and background**

- (1) The Original Idea by Behiye Turan, Ozgur Dogan Yildiz, Dr. Utku Kose
- (2) Idea Additions by Huriye Akkas, Cahit Sahin, Ercan Sahin, Gulay Ilkan
- (3) Technical Arrangements and Artificial Intelligence by Dr. Utku Kose, Ozgur Dogan Yildiz
- (4) Presentation Editing and English Translation by Dr. Utku Kose

#### **Contact details**

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# Solution Details

## Solution description

ABLE (Application for Beating Limitations in Education) is a software system aiming to enable individuals with disabilities to experience the most effective interaction with their mobile devices (even PCs, laptops, etc.).

ABLE will be able to support disabled individuals' interaction experiences in terms of accessibility and make good use of educational processes. Thus, any kind of educational process (regardless of software, etc.) where disabled individuals are taking place will reach its purpose.

Thanks to an evolutionary Artificial Intelligence-based personal assistant approach, ABLE will solve the problem with user and usage pattern modeling over a comprehensive range of disability types.

It is possible to evaluate the performance of the ABLE system with its own technical criteria (in terms of used Artificial Intelligence infrastructure) and also UX feedback.

## Solution context

Individuals with disabilities from different perspectives cannot actively participate in daily life and even education. Except from the known individuals, there are individuals, who do not leave their homes because of their disabilities. Official statistics regarding disabled individuals miss such individuals.

Today's world of technology has the advantages to include these individuals well enough within educational processes. It is easier for individuals to be involved in education thanks to mobile devices / computers / communication technologies (Internet).

Our software system ABLE extends the solution approaches that is generally limited to only visually and hearing-impaired individuals and offers an Artificial Intelligence-based personal assistant solution for the disabled individuals at the following scales:

- (1) Communication Solution: Visually impaired, Hearing impaired, Voiceless, with missing organ(s),
- (2) Directing Support: Alzheimer's, Parkinson's, Movement-response problems.

## Solution target group

The target audience includes the individuals (women and men) with the mentioned disabilities; as being able to participate in educational-interactive processes.

The ABLE system consists of a software to be installed on the mobile device (target computer) and an electromechanical Braille Alphabet keyboard, which can optionally be used. (The device communicates with the keyboard via Bluetooth).

The system enables two-way communication processes as follows:

- (1) Information - command transfer from the disabled individual to the device,

(2) Information transfer from the device to the disabled individual.

## **Solution impact**

Primary Impact: The ABLE system will improve technology-assisted education via patterned user interaction profiles with an evolving Artificial Intelligence infrastructure, thereby maximizing interaction with the device (despite limitations-barriers).

The primary effect can be measured by evaluating UX and performing traditional and/or alternative measurement processes (i.e. exams for the target individuals).

Secondary Impact: Thanks to the social media-oriented software environment, establishing an effective communication network between individuals with disabilities and developing technology-supported communication infrastructure of individuals with disabilities via its evolutionary (always changing, adapting) Artificial Intelligence knowledge base.

The secondary effect can be measured by the changing-evolving Artificial Intelligence knowledge base and by the user's rating for this knowledge base and also official evaluation criteria such as Mean Absolute Error.

## **Solution tweet text**

Do you feel limited because of your disabilities? Do not worry! With ABLE, you will be able to beat the limitations in education as well as life!

## **Solution innovativeness**

(1) The ABLE system is innovative in terms of its architecture and the scope.

(2) ABLE models each user according to their essential information including especially disabilities and interaction profiles. Individuals with different disabilities use different input components such as touch-screen, camera, microphone and receive information via different output components such as speaker, screen, or electro-mechanical Braille keyboard (that keyboard is another innovativeness).

(3) ABLE uses Deep Learning (CNN) and Artificial Neural Networks for detecting sign language, commands, animation to show...etc. It also runs Apriori for evolving interaction patterns (selectible by users), and even ensures social media network.

## **Solution transferability**

Except from educational context, the ABLE system can actually be used in all areas of the life, by people with disabilities. The system will allow individuals to interact and communicate in the best way with the target element. In this case, the whole system is transferred to the new context.

## **Solution sustainability**

Interaction profiles within the system can be recommended to every new user. In other words, the evolving knowledge base (Artificial Intelligence) is sustainable.

The system can both work online and offline (by saving some data to the device).

ABLE can be developed in 1 year: Technical modeling (3 months), Software-hardware development (2 months), Artificial Intelligence knowledge base development (2 months), Tests (2 months), Corrections-final version (3 months).

In medium term, ABLE may become widespread throughout Turkey. In the long run, it may become widespread in Europe and around the world, respectively.

### **Solution team work**

(1) The Original Idea by Behiye Turan, Ozgur Dogan Yildiz, Dr. Utku Kose

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The whole team can continue to work collaboratively in the future.