Software-assisted preparation and assessment of individual education plans for disabled individuals

Yasar Guneri Sahin
Yasar University, Department of Computer Engineering, Izmir-Turkey

This article deals with the use of a computer software in special education. Preparation of Individual Education Plan (IEP) and assessment of predefined IEP are the most important stages in the area of special education for teaching individuals with learning disabilities. A special application software which was developed for this purpose, is used to demonstrate the applicability of a database-integrated information processing system to alleviate the burden on educators. The software allows preparation of individualized education programmes based on predefined objectives and behaviours, and assessment of school and family trainings of students. The software has a user-friendly interface and its design includes graphical tools.

Keywords: Assessment, computer software, individual education plan, special education, technology.

The use of information technologies, Internet and web pages in special education enables education to benefit from the experience of educators and researchers and dissemination of results. A good example is the preparation of individual education plans for teaching persons with various types of learning difficulties. Such a programme requires determination of objectives and behaviours for each individual based on results of similar programmes. In this work, a database-integrated software is described and its use in the area of special education for individual education programme development and assessment is discussed. The software utilizes available information and experiences to guide educators to improve existing programmes or develop new ones. The stored data include units, objectives, behaviours and information about disability groupings.

The software also allows evaluation of individual education programmes that have been applied to certain disability groups. Specific graphics help the educator assess success levels of the subjects individually. In addition, both educators and parents can utilize prepared individual education plans. The software can compare the results, which may be obtained by educators or parents.

The use of computer-based technologies for assessing individual plans certainly reduces educator time that would be spent for this purpose. On the other hand, information technologies minimize human errors in management, data entry and data processing. This would prevent the education plan from progressing inaccurately.

One of the most important assessment criteria in the education of a disabled individual is to determine the time it takes to manage a behaviour. Another important factor is the collaboration between the parent and the school. The software introduced here has been designed to handle all major data acquisition stages and processing problems of assessing Individual Education Plan (IEP) in special education.

Related work

Special education is a complex, individualized and lengthy process. For this reason, information technologies have been used extensively in this area, leading to considerable improvements at various stages. Educational software and hardware elements are usually shaped by national educational systems or cultures. Scientific and technological developments in this area take place in many different countries all over the world.

The use of information technologies in special education is quite common and well accepted by families, educators and education authorities. Pioneering works in this area date back to early and mid 80s. For example, Crawford, and Young and Robbins discussed the use of computer and information technologies in special education. Kiswarday proposed a computer camp for disabled individuals and their families and discussed the positive effects of computer technologies in personal development of such people.

de Graaf described computer software for assessing the progress of children with certain types of disabilities. Krishnawamy introduced a computer-assisted training program for children with mental retardation. There are many similar works in the literature that deal with the use of computers, computer software and computer-assisted special education. Some representative examples can be found in different implementations.

Another group of work deals with particular application areas and the use of audio-visual information technologies.
in special education. Some examples are provided in studies of Moore and Calvert, Trähin, Klaus et al., and Pushchaik and Sasi. Data analysis and individual program development aspects of special education have also been explored extensively in the literature. Many computer software products have been developed and applied successfully in special education. Some examples are IEPPro, developed by Chalkware Education Solutions; ClassIEP, program developed by Technical Perspectives Inc., and netIEP, developed by Netchems.

Kumar presented some innovative ways of science assessment using computer technology for students with learning difficulties. McGain reported results of a study on technology-based assessment in special education. These and many other works studied various aspects of using information technologies for programme development and assessment.

Shriner and DeStefano compared individual and non-individual curriculum applications in special education. Allman studied alternate assessment systems; some works related with assessment of IEP can also be found in the literature. However, due to differences in national education systems and cultural diversities, applicability of related technologies and software is usually confined to a specific country or region.

The computer software presented here can be used to prepare individual education programmes for students and plan measurements and assess their progress. Using the results of teaching that is carried out at school and home, new and improved versions of an individual programme could be prepared for a certain individual. A distinguishing characteristic of this approach is that it is designed to be supportive rather than conductive.

The special education software and preparation of an individual education plan

The Special Education Software (SES) is freely available to any user at the website http://ysahin.yasar.edu.tr. It contains executable version of the software, namely YSE-Setup.exe, developed by this author. SES requires screen resolution to be set to at least 1024 × 768. The source code will not be available to the users.

In the following, the procedure to create IEP is given. Figure 1 shows the screen view when the user opens a dialogue with the application software by clicking on YSE-Setup.exe, followed by clicking on ‘Yagusa Special Education’, that gets created automatically.

Preparation of individual’s personal information record

Assuming that a new candidate is to be enrolled to the school, clicking on ‘Individual Record’ (see Figure 1) allows for creating the database of the student (Figure 2). When the data required in the form are filled, they could be added to the database by clicking on F2.

An individual education plan for a person with a certain disability should be based on the initial diagnosis and a careful assessment of the needs. Therefore, the set of objectives for a programme are chosen in accordance with the initial diagnosis and assessment of needs. At this stage, the objectives for a diagnosed individual are grouped for later explorations. For example, in order to improve verbal or non-verbal skills of autistic individuals, the objectives should be grouped according to disability types of autistic persons.

Figure 1. Main menu of Special Education Software.
In the software there are sample objectives and corresponding behaviour definitions. These can also be manipulated through user-friendly interfaces. Adding or removing objectives can be performed in accordance with the current standing of the student. It is also possible to change information about the behaviours and to alter some of the future contents that are part of the current programme. Table 1 displays category types, grouping and behaviours that the software handles.

**Definition of objectives and corresponding behaviours**

Since the main function of the software is to help educators in training and teaching individuals with disabilities, it is important to be able to define a specific set of objectives and behaviours for each individual. The database contains samples of well-defined and officially approved objectives and behaviours. The contents of the database
contents are quite versatile and flexible, which makes the software adaptable to the programmes of different educators and education systems of different countries.

Defining objectives and behaviours for a programme are achieved by filling a form as follows:

- Open ‘Objectives behaviours’ form (Select from main menu; see Figure 1).
- Enter the objective for the disability category based on personal information such as disability type, age, etc.
- Enter the corresponding behaviours for the objective.
- Enter the success criteria for the objective.

Upon completion of the form, a new objective will be added automatically to the education programme of the individual that is being educated.

Figure 3 displays a screenshot of the form which is used to control goals and behaviours. Since the objectives and behaviours can be subdivided into units, the educational programme of a certain disability group can be formed by combining the units in accordance with the progress of the individual during his/her training. Additionally, it is possible to make alteration in the success criteria for a certain objective. This prevents any vicious circle in training that would be caused by insistent failures of a student.

**Uploading the behaviours according to diagnosis**

When an application is made on behalf of a disabled individual, a fact-finding process takes place and according to the results, the individual education programme is determined. If the disability category for a specific person is known at this stage, many inapplicable alternatives can be eliminated. As an example, consider autism: There will be no need for a test involving hearing or physiotherapy for autistic individuals having just autism syndromes. Additionally, if the weakness of a disabled individual can be identified, it would be easier to make choices among the existing groupings in the table. This way, the objectives and behaviours that will be added to a programme can be determined more accurately.

Figure 4 shows the form that is used to define individual training programme for a disabled individual. Uploading the objectives and behaviours is performed by filling the form as follows:

![Screenshot of the form for defining objectives and their behaviours.](image-url)
• Enter the Id number of the student.
• Enter personal information (disability, group, age, etc.).
• Enter training type.

For example, if a six-year-old autistic child has to receive training in communication skills, the contents of his programme can be obtained by filling the form as described. The software can also be used dynamically for making improvements in an individual education programme. Figure 5 shows an individual education programme, which is prepared for an autistic individual uploading the form. For obvious reasons, the examples in the rest of the communications refer to cases drawn from a school in Turkey. It may be noted that certain comments made in these forms/figures are in Turkish.

Using the software for individual follow-up

An individual education programme constitutes a work plan for a disabled student. Different subprogrammes can be formed for training behaviours at school and home. Each individual subprogramme includes calendar information so that time-related evaluation can be made and the progress of a student can be assessed. For this work, plans are printed and handed out to both the educator and the parent of student. The results are collected and entered as inputs to the software, which carries out the final data-processing work. The outcomes are indications of success or failure, and a graphical display of training records.

Assessing an individual education plan

The software handles the assessment of disabled individuals at three phases:

• Data acquisition from school and family trainings.
• Comparing the data with success criteria and determining satisfaction level of individuals.
• Displaying the results using graphical tools.

Data acquisition from school and family trainings

This is the fundamental step in the assessment of an IEP. Data are recorded according to the format shown in Table 2, and stored in the master database. An educator can access

Figure 4. Screenshot for individual training form.
this database anytime and retrieve necessary information for assessing the progress of an individual education plan. The database can also be used for administrative purposes. Note that format structure of the fields reflects the category of objectives and behaviours.

This structuring allows retrieval of data from a specific category and performs assessment whenever needed. For example, it is possible to evaluate separately, the social and communication skills for an autistic individual at an appropriate phase of training. Data from the parent and school trainings are recorded separately, allowing different assessment for each category. This way, it would be possible to decide whether a disabled individual benefits more from the parent or school trainings. The decision, in turn, would constitute a basis for modifying the plan in a certain direction.

Since accurate data entry is important for later evaluatory work, a carefully designed data entry form is supplied to the user. A snapshot of the training data entry form is given Figure 6. Data that are collected using this form can easily be exported to other software or databases. This facilitates support to the use of collected data for other purposes.

**Comparing the data with success criteria and determining satisfaction levels of individuals**

The collected data for an individual should be evaluated according to the success criteria for the objectives of an IEP. This indicates that an education plan for a specific individual should have a predefined set of objectives, behaviours and success criteria. An example is given below:

Objective ... Establishing physical contact
Behaviour 1 ... gives permission to touch

![Figure 5. Screenshot for an individualized education plan for an autistic individual.](image)
Behaviour 2 ... gives permission to caress his head
Behaviour 3 ... gives permission to hold his hands
Behaviour 4 ... holds someone’s hands
Behaviour 5 ... play games hand-in-hand

As can be seen, this objective has five behaviours and success in four of these is considered to be satisfactory. Thus, the success criterion for this goal is determined to be 4/5. In order to classify an individual’s results as satisfactory, he or she is expected to complete the minimum number of behaviours of the objective and success criteria.

The software compares with the success criteria all the results obtained by a disabled person and determines to what extent the goals have been achieved. Similar operations are performed for data from both parent and school, and the results are entered into the table for later use.

Another important point is the categorization of the goals for possible success standings of an individual. In other words, groupings are used to identify the objectives that are most suitable for the education plan of an individual. Adjustments can be made in the plan in accordance with these groupings. The software also performs computations concerning the types and effects of assistance received by an individual. An example of a set of assistance is shown in Table 3.

<table>
<thead>
<tr>
<th>Code</th>
<th>Assistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Physical assistance</td>
</tr>
<tr>
<td>2</td>
<td>Acts as a model</td>
</tr>
<tr>
<td>3</td>
<td>Remarkable assistance</td>
</tr>
</tbody>
</table>

The effects of a certain type of assistance on success can be computed from the stored data and its convenience for the individual can be determined.

**Displaying the results using graphical tools**

The results of computations can be presented as lists or in graphical forms. The results for specific objectives can be listed according to category and graphical displays can be formed for each category. It is also possible to display the objectives separately. Figure 7 presents an example of graphical demonstration for IEP achievement level.

The form has three pages: Page 1, the page for graphics; Page 2, the page for lists of objectives and behaviours and Page 3, the page for changing results according to categories. When the form is opened the results belonging
to the individual are displayed, which contain computations for all objectives and behaviours. The results can be obtained for family and school information separately.

This form provides an important source in the assessment of trainings for a disabled person, as the contents are objective findings. Displays are intended to support the educators and administration rather than to guide them.

The first graph in Figure 7 (left side) displays the success of the individual based on all trainings that have been received. One of the lines on the graph corresponds to training imparted by the parent and the other line corresponds to the school’s training. Some guidelines for interpreting the graph are given below:

- If the lines are nearly parallel, parent and school works are balanced
- Smaller slopes indicate higher success levels
- If the slope is nearly parallel to the y-axis, the objective has not been achieved in a long time period
- If the slope is nearly parallel to the x-axis more than one objective has been achieved in just a session.

The second graph in Figure 7 corresponds to the behaviours for a certain objective. It provides information about objectives that are included in all trainings, but their success levels are low. The above-mentioned guidelines are also valid for this graph. In the section for listings (bottom) data that constitute the basis for the graph are presented. From these data, it is possible to obtain details for interpreting unexpected graphical shapes. It is also possible to obtain monthly evaluation reports from the available data. An example is shown in Figure 8 where reports include plan and assessment results for behaviours belonging to a month, alongside with personal data, and data on educator and training method. If the assessment for an individual indicates insufficiencies in parent trainings, the educator is warned by the software for arranging a meeting with the parent of the student. Meeting details are also stored by the software in the database for further use at later stages.

**Efficiency analysis**

The results obtained from execution of the software presented here have been analysed to find benefits on Special Education and Rehabilitation Schools (SERS). For this analysis, the software has been executed in two distinct
SERS for 24 months, and then gathered data have been collected for assessing efficiency of the software. Basically, the assessment criteria that are considered are: time spent by the educator with an individual, evaluation and preparation lengths for a student’s training, family education and briefing lengths, and manpower. Table 4 shows some parameters for assessment criteria.

Values shown in Table 4 are gross lengths, i.e. one training length session contains recess, effective training length, preparation of educator for training, recording of training results, etc. Hence the efficient course length decreases from 60 to 30–50 min in accordance with length of the other tasks.

Table 5 shows the time duration for one session of training of an individual with/without software assistance. With software assistance, the recording of results decreases from 10 to 3 min, and preparation time of educator for training decreases from 5 to 2 min. Thus effective training length increases from 35 to 45 min.

Table 5 demonstrates that there is approximately 29% increase (10 min) in effective training length in one session. This increase yields 520 min (i.e. 8.6 h in a month) for
Table 5. Contents of one training session in accordance with software usage

<table>
<thead>
<tr>
<th>Content (in one session 60 min)</th>
<th>Time spent with software assistance (min)</th>
<th>Time spent without software assistance (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recess</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Preparations of educator for training</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Recording of training results</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Effective training</td>
<td>45</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 6. Educator events and time spent on them

<table>
<thead>
<tr>
<th>Educator event</th>
<th>Time spent with software assistance (min)</th>
<th>Time spent without software assistance (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathering data for one student assessment (per week)</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Family–educator briefing length</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Preparation of demonstration for family of student (per week)</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>66</td>
<td>110</td>
</tr>
</tbody>
</table>

each month \(10 \times 13 = 130 \text{ min in a week}; \ 130 \times 4 = 520 \text{ min in a month}).

Table 6 shows the educator events (except training sessions) and time spent for those events with software assistance. According to Table 6, 44 min \((110 - 66 = 44 \text{ min})\) are gained per educator per student in a week, resulting in over gain of 176 min \((44 \times 4 = 176 \text{ min})\) in a month.

Each educator is responsible for training nine students; the school has 180 students and 20 educators. Thus, beneficial time which is 176 min per student for an educator results in 1584 min \(176 \times 9 = 1544\) for each educator. If this value is converted to day format \((8 \text{ h per working day}, 1584/60/8 = 3.3 \text{ day})\) approximately 3 days are gained by an educator in a month. If each educator is paid is $80 an hour, then there is a profit of \((3.3 \times 80 \times 20)\) for the administration per month.

Conclusion

Use of the software that exclusively deals with special education helps educators, parents and school management to improve their work at every stage. The software developed for this purpose takes advantage of integrated database management, processing methodologies and graphical user interfaces. Accurate records can be collected, stored and processed using the facilities provided by the software. Student work and progress are documented automatically according to the individual programme. Assessment of pre-assigned individual education plans is facilitated to a great extent and additional capabilities support the educator in preparing reports and arranging details of education programmes. Thus, educators are free from redundant work involving the filling of various student forms manually and can concentrate on training rather than paperwork.

The software has been shown to reduce the amount of time spent on required special education paperwork by 29% or more. This translates into a saving of more than US$ 250 per student in teacher time alone. Additional savings are realized by the central office administration. As a result, the whole process improves the quality of special education; it also satisfies the increases teachers family and administration. It has been observed that the benefits are especially noteworthy in institutions with large number of disabled individuals.

7. Rienhoff, O. and Wittich, H., REHA – A multimedia system to learn about IT-systems for disabled persons. In Proceedings of the
RESEARCH ARTICLES


Received 25 May 2006; revised accepted 31 July 2006