

# USE OF MOBILE TECHNOLOGIES TO CREATE DIGITAL RESOURCES FOR EDUCATIONAL INTEGRATION OF DISADVANTAGED GROUPS

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## Abstract

The aim of the paper is to share our experience in the creation of digital learning resources for mobile devices to improve the educational integration of disadvantaged learners in the educational system - groups in risk whose ethno-cultural characteristics, special needs or socioeconomic status significantly restrict their ability for adequate education. The work is done within the mRIDGE project. We hope that it will lead to the development and adaptation of training modules, improvement of qualification of teachers dealing with students at risk, new teaching methods with the use of mobile technologies and devices, and generally will have an impact on the socio-economic inclusion of disadvantaged groups. The following educational scenarios are introduced: Encouraging interactivity in training Roma students by means of mobile devices; Training hearing impaired students with the help of mobile devices; Use of mobile technologies to expand training opportunities for students with musculoskeletal disorders; Use of mobile devices for distant training of unemployed people.

Keywords: mLearning; mobile technology; Learning for disadvantaged groups; Educational Technology.

## 1 INTRODUCTION

The creation of digital learning resources for mobile devices to improve the educational integration of disadvantaged learners in the educational system combines the activities of mRIDGE project team members and teachers, dealing with students from groups at risk. They implement their knowledge and experience for defining the objectives of training by means of mobile devices, for selection of appropriate methods and techniques to be used in the process of training and preparation of the corresponding tools for diagnostics of the acquired knowledge.

A conceptual model was developed based on the following prerequisites:

- The specifics of the training of the target groups;
- The specifics of the mobile platforms;
- Studying the educational capabilities of the mobile devices for learning;
- The specifics of presenting digital resources and the access to them from mobile devices in all popular formats: text, images, video, audio;
- The tools for diagnostics of the results of training by mobile devices for the different target groups.

Identification of the basic components of the conceptual model: Acquaintance with the present practices in training by mobile devices; Focusing on the theory of training by mobile devices and its use in practice, the motivational factors, and the strong and weak points of this type of training.

## 2 METHODOLOGY

The conceptual model contains the following elements;

- 1 Mobile learning - characteristics and design principles;
- 2 Mobile learning - mobile devices and platforms;
- 3 Augmented reality technology;
- 4 The specifics of presenting digital resources and the access to them from mobile devices;
- 5 The specifics of the training of the target groups;

## 6 Implementation of four educational scenarios.

### 2.1 MOBILE LEARNING - CHARACTERISTICS AND DESIGN PRINCIPLES

Mobile learning (mLearning) may be defined as the *provision of education and training on mobile devices*. However, to facilitate this mobility, the mobile device should meet several requirements. The learner must be able to use the mobile device wirelessly, standing and with minimal effort. Examples of such devices are smartphones, mobile phones, tablets, iPads and similar devices. There never was a technology as widely available to citizens as mobile telephony. This technology connects people working at different places and having different education and learning paths with opportunities for expert and peer feedback and co-learning.

The mLearning is emerging as a new sector in education and training provision, side by side with face-to-face education, distance education and e-learning. We can say that we have been in the process of acceptance of mLearning since the beginning of the 21st century, along with 3G/UMTS and Smartphone. The new mobile learning arena imposes significant new design requirements for training programs - the ways they are structured and maintained. The effective mLearning imposes specific usability requirement. The assessment of the mobile learning in terms of learning outcomes is similar in all VET systems but techniques in mLearning are specific. The validation of the assessed formal and non-formal mLearning should be done in accordance with the common European principles. The quality assurance should be an integral part of the management of mLearning providing institutions [1].

Mobile learning differs from electronic learning (e-learning) because it uses smartphones, mobile phones, PDAs (Personal Digital Assistants), palmtops and similar devices instead of the desktop and laptop computers of e-learning. This means that mobile learning, unlike e-learning, uses devices which citizens are used to carrying everywhere with them, devices which a man can carry in a pocket or a woman can carry in a handbag and uses devices which citizens regard as personal, friendly, cheap and easy to use. A further difference is the mobility of the learner in mobile learning. The mobility of the learner is seen with commuters on buses, trains and metros, with learners on the job for instance on a crane or at a base station and with learners at art galleries, museums or tourism locations. A major difference is in the type of technology used which means that there are types of learning that mobile learning can do that the other sectors of education and training (face-to-face, distance education and e-learning) cannot do or cannot do as well as mobile learning: context sensitive and location sensitive learning materials and augmented reality.

The use of mobile devices and related to them digital resources for the purposes of educational and social integration is an innovative solution of a need, which has arisen in society:

- Mobile technologies give freedom both to teachers for complex presentation, and to students for extended study of a considered problem in accordance with their educational needs, what, according to the constructivist views, is a condition for manifestation of independence and initiative.
- The application of these technologies overcomes the limitations related to time, place and volume of the school material. The students can use these technologies both in the classroom and out of it in convenient time, and they can access a wealth of information resources.
- The use of these technologies does not require from the students preparation in advance. The interactive multimedia products are usually complied with their intuitive perceptions and their personal preferences and offer very good possibilities for building up steady interest and lasting motivation.

The benefit of this type of innovative learning is justified by the fact that the students willingly and enthusiastically accept everything new, related to technologies. The news in the field of technologies, applied to education, lead to raised motivation for active participation in the process of learning, considerable improvement of the process of memorizing the school material and, owing to the use of more senses, to possibilities for facilitating the learning process for disadvantaged people, what makes education more effective.

### 2.1.1 Instructional design guidelines for mobile learning

#### A. Cognitive load theory and multi-media learning

Cognitive load theory and multimedia learning are both based on two basic principles which underlie the cognitive processes which operate in supporting or inhibiting human learning. First, the theories make a distinction between working memory and long-term memory. These two types of memory form a complimentary partnership, although they work in different ways. In working memory all cognitive processing occurs, but it has a very limited capacity and could be easily overloaded. These limitations of working memory should be taken into account, when designing courses. Second, the theories propose the existence of two channels of processing information in working memory: visual and audio. Being a sub-component of working memory, each of these channels has a limited capacity and both should be used to make learning more efficient.

#### B. Minimalism

The minimalism instructional design theory and practice is based basically on three key ideas about how people learn: (a) instruction should not obstruct the natural way people learn when they explore learning tasks; (b) people make errors and they learn from their mistakes; and (c) when approaching learning tasks, people make use of their knowledge and skills in the context of specific goals and expectations.

#### C. Technical Affordances Guidelines

There are a number of general purpose principles of mobile learning that should be taken into account: Keep the information short, because mobile learning content is bite sized; Make sure the learning components are relatively short in duration; Do not use complex navigation and interfaces; Along linear navigation, consider the possibility of non-linear design; If you opt for non-linear navigation build a hierarchical structure of the content and provide access through drill-down navigation via hypertext links; Provide a link to the launch screen on all inside screens; Try to avoid using large, detailed images and graphs; Try to avoid horizontal and vertical scrolling; If you use rich media, consider possible bandwidth issues; Make access easy. It is acceptable if you download information by PC first; Take into consideration the cost factors of accessing mobile learning content.

### 2.1.2 Strategies for effective mobile learning

*Learner attention:* When developing mobile learning materials it is important to consider the reactions students should have when studying these materials. Foremost amongst these is learner attention. At the start of each course, strategies need to be designed to get and hold learner attention. This can be done by a carefully chosen phrase, as graphic or an illustration chosen and designed to arouse and hold learner attention.

*Learner focus:* Mobile learning materials have to be designed to develop and support learner focus and learner motivation. The reason for this is that mobile learning, like other forms of distance education, does not usually take place in school classrooms or other locations specifically designed for learning. It often takes place with the student as a solitary learner, removed from the support of other students and of mentors, teachers and other educational personnel.

*Relevant content:* To maintain learner motivation and learner focus the mobile learning manager needs to ensure that the mobile learning course content is relevant: relevant to the course objectives, relevant to the students' needs and relevant to the employment goals that are involved in the reasons why the student is studying the course.

*Interactivity in mobile learning:* The mobile learning manager should always check that interactivity is included in the mobile learning materials developed by his or her staff. Interactivity means that interaction is built into the materials in a way that stimulates the student's mind to be ready to perform effectively the skills learned from the materials.

*Retention and transfer in mobile learning:* The mobile learning manager needs to check that the mobile learning materials developed by his or her staff focus on the retention by students of the knowledge learned. Accepted methods for achieving this are the provision in the learning materials of opportunities for the consolidation of what has been learned, opportunities for reflection on what is contained in the course and the provision of assessment for testing the knowledge and skills learned, either by self-assessment questions (SAQs), or tutor-marked assignments (TMAs) or assignments that are marked by the mobile device (DMAs).

*Location and context sensitive mobile learning materials:* Using software, which overlays digital sight, sounds and interactions onto the physical world to create immersive and interactive experiences and QR Codes, it is possible to produce location and context sensitive course materials for mobile devices. QR Codes are a form of visual data encoding that will support attaching device-readable data to the ambient environment, allowing a location to provide information to the user.

### *2.1.3 Pedagogical framework*

The introduction of new technology does not necessarily implicate that existing pedagogies and learning theories need to be revised. Learning theories such as behaviourism, cognitivism, and constructivism, can provide guidelines on how to implement mobile technology in such a way that it enhances the students' learning processes. From a behaviouristic perspective the learner has no influence on the standardised learning process. From a cognitive perspective, the individual differences between learners are recognised and the learning process should be adapted to the individual needs. From a constructivist perspective, learners actively construct their knowledge through interaction with their environment and interaction with others. The learner through his or her learning activities imposes meaning on the world. The learners construct their knowledge and understanding through the learning experience, this knowledge is constructed rather than discovered.

### *2.1.4 Assessment in mobile learning*

It is important for the field of mobile learning that the assessment of students' work should be just as rigorous in mobile learning as in other forms of educational provision. In spite of the dexterity of students today in data input referred to above it is unlikely that essay-type questioning, a feature of many European universities, would be feasible as a form of assessment in mobile learning. The reasons for this are the difficulties of data input for a considerable amount of text and the area on a mobile phone screen available for assessment.

Assignments which are useful on small screens are short questions with automatic feedback, quizzes, multiple choice assignments and other assignments requiring little amounts of textual input from the user, such as a vocabulary test. It is possible to design multimedia assignments, for instance in Flash, such as drag and drop and other types of assignments if the device has support for them. Multiple choice questions with 4 possible answers fit easily on the screens of mobile devices.

## **2.2 MOBILE LEARNING - MOBILE DEVICES AND PLATFORMS**

All mobile devices have a number of hardware features in common like the display, the battery, an input mechanism to allow the user to interact with the device, an antenna etc. but their characteristics can be distinctive of the different types of mobile devices (mobile phones, smart-phones and tablets) and of particular importance when these devices are also though for a m-learning use. In this light, it's possible to distinguish the following features: Screen size; Weight; The interaction method.

The modern mobile operating systems combine the characteristics of computer operating system with others that are typical for mobile devices such as touchscreen, GPS navigation, camera or cellular communication. The most common mobile operating systems are: Android from Google; iOS from Apple; Blackberry OS from RIM; Windows Phone from Microsoft.

## **2.3 AUGMENTED REALITY TECHNOLOGY**

Augmented reality is an environment that includes real world and virtual world experiences. The nature of technology Augmented reality (AR) has the potential power to build a proper learning environment so as to satisfy the natural curiosity of students to explore the world according to educational tasks. Augmented reality may help usher in a new era for education, one that is more capable of teaching students because it can engage them through a medium that is nearly universal with all consumers: Mobile technology. Mobile technology and technology Augmented reality provide an opportunity for freedom, both teachers for integrated presentation and the students for advanced study of the problem, which according to constructivist views is a prerequisite for the manifestation of independence and self initiative. Students do not require preliminary preparation to use these technologies. Technology Augmented reality is based on their intuitive perceptions and their personal preferences, and offers many opportunities to build sustainable long-term interest and motivation. The advantage of using AR systems instead of other technologies is that results highly intuitive for people who have no experience with other computer systems. Thus, even the youngest students can enjoy a fun interactive experience. The application of these technologies overcomes the limitations in terms of

time, place and the size of educative materials. Students can use these technologies in the classroom and beyond, at a convenient time and have access to a plenty of information for learning.

There are two main forms of Augmented reality technology, currently available to educators. The first form is based on a visual metaphor, the second counts of spatial positioning. In the first method, the so-called "markers" (such as QR code) which are visual cues can be "seen" by the camera of the mobile device. Markers are used to accurately determine the location and nature of the object. When the marker is decoded by software, digital resources for the object are provided (text, images, audio, video, 3D models). Spatially positioned apps use GPS and digital compass for determining the location and provision of digital resources for locating objects in this place. Regardless of whether the marker is detected or using spatial positioning, augmented reality is implemented in a specific context. Contextual information on what the user wants to visualize on the right place is obtained. QR codes are a matrix barcode that contains information which is displayed after scanning the code [2].

### *2.3.1 Use of "augmented reality" technology by mobile devices for the purpose of active learning*

The technologies used for the purpose of active learning, should provide the following four key characteristics of active learning: Engaging different senses of students (hearing, seeing, feeling); Using the hands; Interaction and collaboration; Construction of new knowledge based on what they have learned.

### *2.3.2 Engaging different senses of students*

Research shows that students learn faster and durability of their knowledge is longer when the learning process involves not only their hearing, but their other senses. With regard to memory there are three types of students: "visual", "hearing" and "kinaesthetic".

- "Visual" students. Most effectively learn and remember written information, diagrams, pictures and symbols. They are about 65% of all students.
- "Listening" students. They are most effective in speech communication, in lectures and discussions. The written texts are not so important. Especially importance has the quality of speech - timbre, tone, strength. They are about 30% of all students.
- "Kinaesthetic" students. They learn effectively through contacts and movements, imitation and practice. They are about 5% of the total.

Using the "augmented reality" technology by mobile devices allows presentation and / or complement of the educational content with a variety of multimedia resources - text, still images, audio, video, 3D / 2D animation. The added advantage here is that this information is provided depending on the context or location of the student. Thus AR creates additional experiences for students, contributes to a better perception of curricula, stimulate the imagination and creativity of the students.

### *2.3.3 Using of hands*

The "augmented reality" technology with success can be used for the study of complex spatial concepts. Most often this is done by modelling of 3D objects. The students can with their hands to manipulate the model – to move it, to rotated it, to increase or decrease it (by zooming in or out the camera of the mobile device from the marker), thus objects can be viewed from different angles. This maximum closes interaction with virtual objects to the interaction with the physical ones and thus helps build visual images and spatial relationships among students.

### *2.3.4 Collaborative learning and learning through interaction*

Collaborative learning (in some ref. sources it is translated as "learning through cooperation") and learning through interaction (collaborative and cooperative learning) are one of the most common training models used in active learning. It has been shown that they improve the skills for learning, thinking and communication skills. The main features of this study are defined as: presence of common purpose accepted by all, around the group to unite their efforts and be rewarded for the achieved result; the sense of individual responsibility, which means that all members of the group consciously contribute to the realization of the target; the teacher structures and guides the activities in groups.

Regardless of the educational scenario, mobile devices can support interaction and collaboration of students. Students can interact with teachers and peers as synchronous or asynchronous communication can exchange resources through the camera of the mobile device. Moreover, camera, GPS, accelerometer, gyroscope of the mobile device are the main hardware components of applications (games) for augmented reality. The collaboration between students in this case is achieved by sharing common markers.

### 2.3.5 Construction of new knowledge

One of the principles of active learning is that knowledge is not translated, but it must be constructed. To achieve this the learning environment must offer rich opportunities for learning through real life situations that require students to work together, follow their pace of work and cooperate with each other. All these conditions can be successfully achieved through a combination of: Appropriate methods and techniques; Appropriately selected digital resources; The opportunities offered by augmented reality by mobile devices for joint learning; The opportunities offered by augmented reality by mobile devices and for the use of hands during learning.

## 2.4 THE SPECIFICS OF PRESENTING DIGITAL RESOURCES AND THE ACCESS TO THEM FROM MOBILE DEVICES

The term digital learning resource is used here to refer to materials included in the context of a course that support the learner's achievement of the described learning goals. These materials consist of a wide variety of digitally formatted resources including:

- Graphics images or photos;
- Audio and video;
- Simulations;
- Animations;
- Prepared or programmed learning modules.

Digital learning resources are different from traditional physical textbook in many ways. One obvious difference is that digital learning resources can be multi-modal, which means that the communication can be made both visually and auditory. Furthermore, visual presentations in digital format can be made not only as still pictures but also as short video sequences or animations. Another difference is that digital learning resources can be constructed as simulations, where the simulator represents a physical environment in which it is safe and inexpensive to make dynamic experiments.

One further dissimilarity is that most textbooks have been developed within the framework of the public school system with its specific traditions and rules regarding what kind of goals students should reach. Many digital learning resources have a different story – not necessarily emanating from the needs of the school system but a broader commercial market or social context.

A learning resource can refer either to any resource used by teachers and students for the purpose of learning, or to only resources particularly designed to be used in learning settings. To conclude, this means that by digital learning resources we understand any digital resource that is actually used for the purpose of learning.

When we talk about learning systems, the educational content and how it is presented to the user is of great importance. Learners receive all their educational materials in traditional learning and e-learning in the form of text documents – books, leaflets, presentations, pdf documents. Coming to a new platform – the mobile, they have to change the way they accept and interpret data. The information conveyed on one screen for an e-Learning may need the equivalent of three or four screens on the mobile device.

The screen size is critical to presenting data to the user. Bigger images will force the user to do a lot of scrolling. Reading longer texts on a smaller screen makes the user uncomfortable and can cause serious eye problems.

A solution to these problems are sound and video files. Long texts can be narrated. This way the learner doesn't have to watch the screen and could sit relaxed and concentrate on the materials. Video files are an even better approach. Through such rich media the system gets more interactive: interesting animations like, for example, physical laws can be animated and therefore interactively explained.

#### 2.4.1 *The following conclusions can be made:*

- 1 One of the advantages of designing mLearning is that it forces us to express the most with the least; it compels us to design concise, elegant content and remove the superfluous.
- 2 If the information can be shown interactively – in the form of animation or video, then results could be better than expected.
- 3 Downloading larger files could cost more at some places, according to the data plan of the user. Therefore it is best to use lower bit rates for audio and video, and make the video screen smaller.
- 4 Textual content should be used for short pieces of information and tips.

## 2.5 THE SPECIFICS OF THE TRAINING OF THE TARGET GROUPS

### 2.5.1 *Profile of Roma children*

Romani community is encapsulated and non-integrated into the society as a whole. Nonrecognition of universal and European values like education, democracy, citizenship, the very peculiar application of concepts such as freedom, democracy, tolerance and solidarity, form a very special status of the group. Because of the statutory nonrecognition of Roma as a different group, educators face the complex task to adapt the existing educational models to the psychological and pedagogical characteristics of the community and to seek flexible approaches within the existing educational standards.

The low educational outcomes of Roma children are a function of the general attitude towards the education in general. The reasons are bad discipline, specifics of motivation, undeveloped ability for self-regulation of behaviour. It should be noted the absence of the family as a major factor for motivation and adequate self-assessment.

At the same time children have a high degree of empathy and a passion for creating authorities but educators do not benefit sufficiently from these characteristics. The low accumulation of intellectual and cultural potential can be compensated to some extent by high expansiveness in communication and well-developed intuition. In this sense, educators can use practical modelling in subjects such as biology, chemistry, physics, man and nature, and virtual tours in geography and history as well. At the same time Arts subjects could complete the process with the introduction of emotional and psychological aspects. The moment of modernity imported by modern technologies should be used to increase the level of knowledge and skills.

The majority of students have mobile phones, only few of them - smartphones. The children do not have Internet access at home, which precludes from using of email, social networks and various mobile applications. At school the students use the mobile devices primarily for retrieving information. Students on the other hand express readiness to learn by using mobile devices and to go beyond the hyperstructured and conceptually ordered process.

Observations of experts drawn from the work in class and from tests have shown that students hardly succeed in retrieving causal relations from purely textual information, whether offered in oral or written form. They much easier draw conclusions on practical demonstrations, combination between text and images, illustrations, diagrams and tables. Students like presentations, short movies with audio, which can significantly increase the percentage of remembered information.

### 2.5.2 *Profile of children with hearing impairment*

The level of social adaptation and the level of the established skills and knowledge of students is low. This is due to many factors: hearing impairment, presence of other disease in many children, social neglect, difficulties in communication within the family and with others, personal peculiarities of character.

Educational environment is very specific. This requires the use of an individual approach to each one, in any mode moment: training, rehabilitation of hearing and speech, educational moments, self-study, free time. Techniques are considered and applied to the capabilities of each child.

Mostly all teachers use digital resources (text and pictures) in order to increase efficiency especially in teaching subjects and rehabilitation of hearing and speech. Some support the process by means of video and very rarely – by movies. The reasons are different: no Internet in school, students' access to

computers only in IT classes, which are held in a specially designated lab or labs for Hearing and Speech Rehabilitation, insufficient skills of some of the teachers to work with modern technologies.

The students are very interested in using mobile devices, except for a few children with multiple disabilities. Most of them have their own phones, and some have laptop or home computer. Very few of the students can seek basic information. Basically, all use communication applications: Skype, Viber and Facebook. The modern mobile devices are very important for children and for all deaf people. They enable them to constant communication through facial expressions and speech by gestures between them and the opportunity to communicate with hearing people by writing.

All respondent children believe that mobile devices will help them in planning and understanding of the learning material, mostly by watching video films and clips.

### *2.5.3 Profile of unemployed people*

The socio-economic profile of Smolyan region, Bulgaria in its overall appearance does not change much in recent years. Negative demographic trends are growing and the population of the area decreases. Economic development is characterized by different dynamics, but is still low compared to average indicators for the country and other regions of the SCR (South Central Region). As a result of the ensuing economic crisis it is the increase in the unemployment rate. Unemployment in the region is still above the national average level. Smolyan region is on the fourth place by the most unemployed people in the country.

20% of Bulgarian youths do nothing, they are about 250-300 thousands of young people, for which the state loses incomes, because of their passivity in the labour market. This puts us one of the first places in Europe by number of young people who do not do anything. They are not active at school, some of them drop out of education due to poverty.

There is a strong correlation between low literacy, low educational attainment and unemployment. On the flip side, many activation programmes are designed on the assumption of people having stronger literacy and numeracy skills than exists in the population. This limits the opportunities for people who are unemployed with literacy and numeracy difficulties. Unemployed adults who have gaps in their basic skills or no qualifications often take a long time to get back into jobs. Unemployed adults need help getting a job but have gaps in their basic skills.

We must focus on the increased attractiveness and use of online learning. A key advantage of online learning is that it can offer access to training when, where, and at a pace that suits the individual learner.

### *2.5.4 Profile of teachers*

The success of learning technologies depends on the extent to which they take into account the existing learning context. Educators should be involved throughout the entire process of designing, developing and implementing mobile technology integration. They need to 'accept' and 'embrace' this innovation in order to successfully integrate it in their teaching practices. Most of teachers possess several types of mobile devices and they use them frequently for communication, information access, social interaction, and less frequently for teaching and preparing teaching materials.

Additionally, educators need to be trained how to apply mobile devices in their practices. To integrate computers in classroom practices, researchers were addressing the need that educators should be computer literate; in this case they have to be mobile literate. This is a greater challenge because they have to deal with various types of equipment (hardware) and software. The role of the educators needs to move towards facilitation and not teaching.

As a general conclusion, we can observe that both students, as well as teachers, agree upon the fact that mobile technologies represent a useful tool in the process of teaching and learning for high school students with disabilities. Nevertheless, there is a difference in perception: the students are more interested in getting media information as quickly as possible, while the teachers are more focused on the educational benefits of the Internet.

## **2.6 IMPLEMENTATION OF FOUR EDUCATIONAL SCENARIOS**

Four educational scenarios were developed within the mRIDGE project:

- 1 Encouraging interactivity in training Roma students by means of mobile devices;

- 2 Training hearing impaired students with the help of mobile devices;
- 3 Use of mobile technologies to expand training opportunities for students with musculoskeletal disorders;
- 4 Use of mobile devices for distant training of unemployed people.

The design of educational scenarios is based on the following prerequisites:

- The implementation of the “augmented reality” technology by using mobile devices in the educational process allows for applying specific approaches, based on the modern pedagogical theories and their realization in practice, what is due to the fact that it can be implemented successfully in training. Thus the interest toward attending study will be increased, as the students will look at their classes as a place for interesting and creative activities.
- The use of mobile digital resources during the lessons will practically contribute to students’ knowledge and skills integration and forming competences in various fields of knowledge. The students with special needs will be encouraged, by means of increasing their motivation and self-assessment for obtaining better education with a view to a better perspective for their socialization and fulfilment in life.
- Appropriate use of “augmented reality” technology on mobile devices in training creates prerequisites for full control over the basic components of the material.
- Training with the help of mobile devices has the potential to enhance the access to education for students, to create supportive learning environment, adaptive to their individual needs.
- The fourth scenario addresses people who do not have access to education as it is far away from their place, because of lack of finances, or because of socio-economic isolation. Obtaining additional training and qualifications is a prerequisite for start a job. For this scenario a package of courses for initial vocational training will be developed based on the platform for electronic training DIPSEIL [3].

### 3 CONCLUSIONS

- A conceptual model for a creation of digital learning resources for mobile devices to improve the educational integration of disadvantaged learners in the educational system was developed.
- The specifics of the training of the target groups were outlined.
- Four educational scenarios were implemented.

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