

QUALITY METRICS FOR EVALUATION PROCESS IN M-LEARNING ENVIRONMENT

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Abstract

Mobile devices are used every day more and more and in the educational environment. The M-Learning term has become a term also known as e-learning. Also knowledge evaluation is done through mobile devices. But it is necessary to determine the quality of the evaluation process and the influence of some factors on the results obtained by students in the evaluation process through mobile applications. In this paper a quality metric is built. The metric will be used to determine the quality level of the evaluation process performed through mobile devices.

Keywords: Quality, mobile, evaluation, learning

M-Learning Environment

Mobile learning is the next stage of development of e-learning technology and help to increase the formal education. M-learning systems do not replace the use of computers to help process evaluation and learning, but completes with new interesting methods available to teachers. The main objective is to create flexible solutions evaluation, which will allow access to all kinds of information devices and flexible materials to produce a variety of situations.

The education system consists of four major resources presented in the following:

- R1 - learners represented by pupils, students or any other person willing to improve in a specific area;
- R2 - teachers or trainers represent the people who are providing educational materials to resource R1;
- R3 - educational materials, represented by papers and courses provided by the R2 to R1;
- R4 - results represented by the marks obtained by the R1 to assess knowledge acquired in consultation resources R3 provided by the R2.

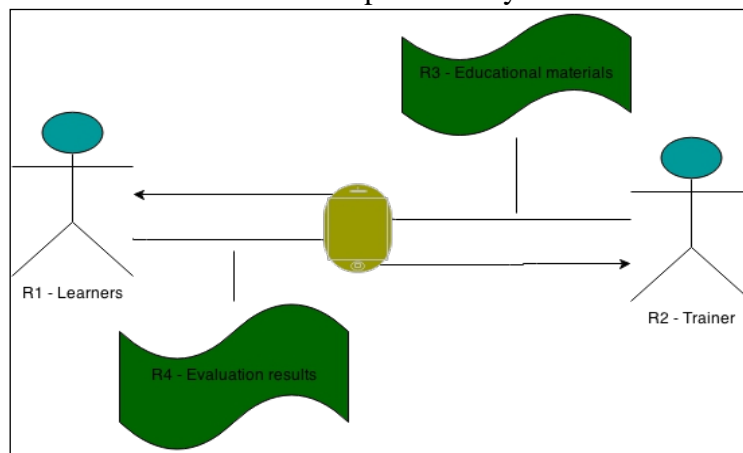


Figure 1. M-Learning resources

Ubiquitous character of mobile devices is implemented in the mobile applications used in educational environment through the following improvements:

- learners (R1) have access to educational resources regardless of time and space;
- transport of educational materials (R3) is done implicitly by the transport of mobile devices that are stored in electronic format;
- providing the new educational materials (R3) without the need of a teacher (R2) meeting face to face with people who need these materials (R1);
- knowledge assessment is done regardless of time and space; such user (R1) sustains the test when he wants when he feels ready and in the place where he feels inspired to support the test;
- the teacher (R2) automatically get the results (R4) and analyze them later easily support testing.

In this way the use of mobile devices for each resource adds the education system..

M-Evaluation of Students

Assessment of knowledge acquired by persons who acquire new knowledge consists in realizing the questions that are addressed to them. Evaluation is done by the following methods(Dumitrache, 2012):

- traditionally on paper;
- in the online environment through a web platform where the user logs in, respond to questions and then received the results;
- through a mobile application like web application in which user logs and respond to questions.

The difference between get the test via web application and via a mobile applications is that via the mobile application the test is available anywhere regardless of time and space. In this way users can take the test anywhere they want and at any time they want. In this way was developed the mobile application MCSAM (Hafizul and Khairuluanar, 2012, Pocatilu, 2012). Through MCSAM application users tests which contains questions with five possible answers (Boja and Zamfiroiu, 2013), figure 2.

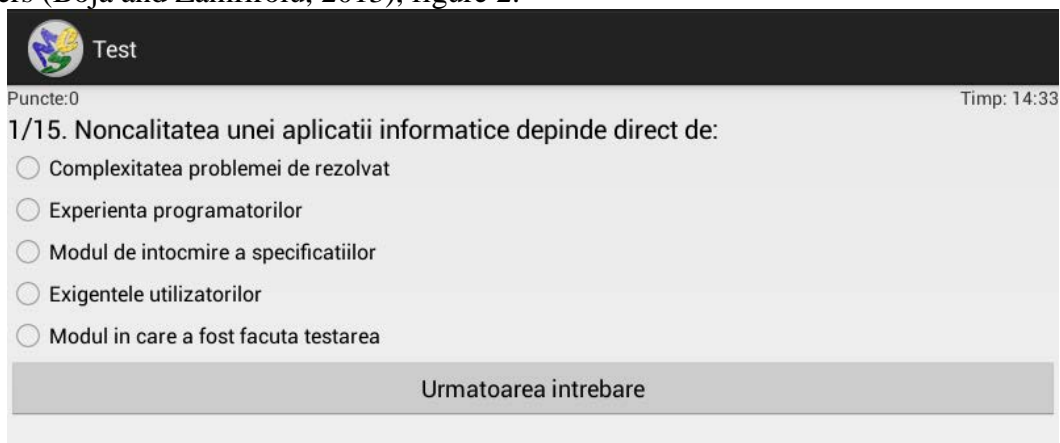


Figure 2. Question in MCSAM application (Zamfiroiu, 2014)

Questions for each test performed by each user are selected randomly from the set BQS.

$$BQS = \{Q_1, Q_2, \dots, Q_{ns}\}$$

where ns represents the number of the set of questions that are chosen for test.

From this set are chosen randomly nt questions forming the TQS set:

$$TQS = \{Q_1, Q_2, \dots, Q_{nt}\}$$

where nt represents the number of questions on the test to be sustained.

The BQS set of questions is stored in the database server and through a web service (Zamfiroiu, 2013) chosen questions for the test are sent to the mobile device.

The order in which they are placed in the test is also randomly chosen. The web method which order randomly the questions is presented below:

```
[WebMethod]
public string ordineIntrebari(int numar)
{
    string rezultat = "";
    int[] vector;
    vector = new int[numar];
    for (int i = 0; i < numar; i++)
    {
        vector[i] = i;
    }
    int l_v = numar;
    int[] ordine = new int[numar];
    while (l_v > 0)
    {
        Random r = new Random();
        int poz = r.Next(l_v);
        ordine[l_v - 1] = vector[poz];
        for (int j = poz; j < l_v-1; j++)
            vector[j] = vector[j + 1];
        l_v--;
    }
    for (int i = 0; i < numar; i++)
    {
        rezultat += (ordine[i] + 1).ToString() + " ";
    }
    return rezultat;
}
```

The answers to the questions provided by the user are saved in the database for further analysis. Are also saved and times when users claim they test and the time spent to solve test.

Quality Metrics for M-Evaluation

Quality assessment through mobile devices is tracked at:

- user; surveys are conducted for each individual user;
- the time spent by the user to solve the test;
- number of checking the existence of the test - user check if the test is available but not dare yet to sustain and support to postpone the moment when he feel ready to sustain it;
- number of checks of the result obtained - shows the user confidence in the result and check often fear that this will change.

To determine quality, two indicators are built on the basis of parameters saved in the database.

Indicator for checking the availability of the test for each user i , ICD_i , is constructed by formula:

$$ICD_i = 1 - \frac{NDC_i}{Re_i}, i = 1: nu$$

where:

- NDC_i - number of checks for the existence of the test by user i ;
- Re_i - the result obtained by the user i ;
- nu - number of users who take the test.

Indicator of checking the result obtained for each user i , IVR_i is constructed by formula:

$$IVR_i = 1 - \frac{NRC_i}{Re_i}, i = \overline{1: nu}$$

Where NRC_i represents the number of checks of the result.

Using the values of these two indicators metric for determining the quality evaluation performed through mobile devices is built. Thus the aggregate indicator AIQ_i is buildet by formula:

$$AIQ_i = \frac{ICD_i + IVR_i}{2}$$

This indicator will be applied to the saved data after testing students with application MCSAM, in this way the new built metric on the quality evaluation of students through mobile devices will be validated.

Conclusion

The proposed targets for the knowledge evaluation process is done through mobile applications if this process shows a high level of quality.

In this article we propose a model for building an aggregate indicator metrics for the assessment of knowledge performed through mobile devices.

The indicator will be verified based on real data then can be used to determine the M-evaluation process quality

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