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Students' Unsupervised Experience in Eassessment With the Tesla System

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***Abstract*-The concept of eAssessment with the adaptive and trust-based TeSLA system is introduced. The TeSLA system is an innovative product developed according to the TeSLA project supported by the European Commission in the scope of the H2020 programme. Students' unsupervised experience in the eAssessment framework during the performed third pilot in the course Electronic Servicing in Public Administration is examined and evaluated through applying the fuzzy approach and the shortest path method. Analysis of the results, as well as relevant discussion and conclusions are proposed. The findings point out the possible paths in the eAssessment environment, consisting of Moodle Learning Management System and the TeSLA system, under unsupervised conditions for achieving rich experience by students. Also, the shortest path is obtained and discussed.**

Keywords-Students' unsupervised experience, eAssessment, TeSLA, fuzzy approach, the shortest path

I. INTRODUCTION

eAssessment is a process important for teachers as well as for students contributing to understanding the level of their knowledge and achieved skills during a course [1]. Assessment of unsupervised tasks is not so well explored topic by educators and researchers and evidence for this fact is the small number of published papers. For example, Kibble reports the findings of an experiment for usage online unsupervised quizzes in formative assessment [2]. The author concludes that formative online quizzes lead to better results in summative examination. Unsupervised assessment is related to the self-regulated learning, but the terms are not the same. Self-regulated learners initiate and direct their own learning process without the support of teachers or anybody else [3], [4]. Also, unsupervised assessment is related to the personalized learning which is described as learning with self-designed learning paths and activities by students according to their learning needs and interests [5]. In spite of them, supervised learners perform tasks designed especially for them by teachers to facilitate their learning. In this case, the students only have possibilities to manage the tasks performance in their own way without the teachers' support. The assessment activities designed for conducting in unsupervised conditions have to be prepared in instructive and clear manner in order to facilitate students. Also, the assessment environment has to propose functionality that will guarantee examinees a fair, transparent and robust assessment process during task conduction, submission and feedback delivery. In this work an experiment with the TeSLA system is described concerning the gained experience by students in their assessments tasks performance without teachers' supervision. The TeSLA system is an adaptive and trust-based solution for eAssessment in online and blended-learning environment. It is developed in the scope of the TeSLA project, funded by the European Commission, according to the H2020 programme [6]. The TeSLA system is implemented in the form of plugins added to the Moodle Learning Management System (LMS) and proposes five instruments: three instruments for students' authentication – instrument for face recognition (FR), voice recognition (VR), keystroke dynamics (KD) and two instruments for authorship verification – forensic analysis (FA) and plagiarism (PL). Thus, the assessment tasks are designed by teachers in Moodle LMS typically as assignments and quizzes with possibilities one or more TeSLA instruments to each assessment activity to be added. The unsupervised students conduct assessment tasks in their own way – with their speed, in time and place suitable for them. They can choose what kind of additional learning resources will explore to finish the tasks. Different students perform their unsupervised assessment activities with different efficacy and quality. It depends of student's profile - existing and achieved competences, learning history and background, students learning style, motivation and personality. Despite the students are directed through the instructive guidance prepared by the teacher in assistance of their formal learning, always unsupervision is accompanied by ambiguity and uncertainty related to the task management, performance and gained experience.

The aim of the paper is to present the findings obtained during the third pilot of the TeSLA project concerning the gained unsupervised experience by students. It is evaluated thought utilization of fuzzy apparatus and the shortest path method. The results are analysed and discussed. An assessment model for unsupervised students is proposed.

II. THE PERFORMED PILOT AND STUDENTS' EXPERIENCE

In the course Electronic Servicing in Public Administration (ESPA) two assessment activities were designed to be conducted by students without teachers' guidance through utilization of the TeSLA system. The first one is focused on preparation of an explorative report on individually assigned topic with aim to contribute to the development of the following students' competences: to be able to explore, summarize and analyse materials and to be able to prepare unique written report. According to this aim the TeSLA instrument for plagiarism check was added to the assessment task to confirm the original nature of the prepared report. The second involved instrument was for student's authentication: face recognition that had to verify the student's identity at the time of report submission. Other assessment task was designed to develop the students'

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competences: analytical thinking and self-organization. It was individually prepared by students in the form of a written report and their authorship work was checked thought the TeSLA instrument FA that contributes to confirmation or not the uniqueness of the student 's writing style. The second applied instrument for this assessment activity was FR for student's authentication. Both assessment activities contributed to the final mark formation.

In literature, the students' experience is described in a wide variety of ways. Coates, Kelly and Naylor summarize the new perspectives on the students' experience through "nine qualities model" [7]. These nine qualities form three groups: (1) *students' views* group with three qualities: *educational value* for the student, *belonging to the academic community*, and *identity formation* through achievement of meta competences like to be able more responsible citizens, (2) *students' outcomes* group with four qualities: *discovery* experience through research, new understanding formation, gathering new ideas and skills, emotional engagement, social network creation; *achievement* related to the good marks, passed units and course, reached knowledge and skills; *connection* through building academic network inside and outside the university; *opportunity* for academic and professional development, (3) *students support* group with two qualities: *enabled experience*, giving possibilities to students for achievement of competences of self-regulation and meta-cognition; *personalized experience* according to the personal learning needs and personal characteristics. Baker connects students' experience to the gained *competences* through their participation in competency-based programs [8]. The achieved results, including experience are measured through gained competences that will support students in their future career. Cox points out the importance of *physical and virtual university spaces* for students' gained experience during their learning and influence of spaces on socialization, surface engagement, hospitality, criticality and solidarity [9]. Strydom and Mentz discuss the students' experience from the perspective of the students *engagement* [10]. They describe the student engagement through two components: time and effort for task performance and applying effective educational practice to stimulate students success.

In the scope of this work, the students unsupervised experience is related to: the design of assessment activities, features of the eAssessment environment, existing and gained competences, assessment activities performance, achieved results, assessment paths.

III. EVALUATION OF THE STUDENTS' UNSUPERVISED EXPERIENCE

Students' unsupervised experience in the eAssessment environment in Technical University of Sofia, consisting of Moodle LMS and the TeSLA system, is characterized with negative and positive points, because of existing uncertainty and blurriness from teachers' point of view. This uncertainty and blurriness concerning the students' unsupervised experience is analysed taking into account the following criteria: existing students' competences, possibilities for students to receive new knowledge, enrolment performance, assessment activities performance, access to knowledge resources, usage of available instructions for working with the TeSLA system, TeSLA system interface, Moodle functionality. To evaluate the gained students' experience without teachers' guidance, the fuzzy approach and the shortest path method is applied [11]. The path net is constructed and presented on Figure 1, where each edge is one criterion. The most used arcs are visualized. Other arcs are not shown in order to keep the model not so complex. The aim is the shortest assessment path from student's starting statement to student's gained experience to be found that will outline the important criteria for the effective assessment path and rich experience gaining during the TeSLA pilot and it will be a base for development of an assessment model for unsupervised students.

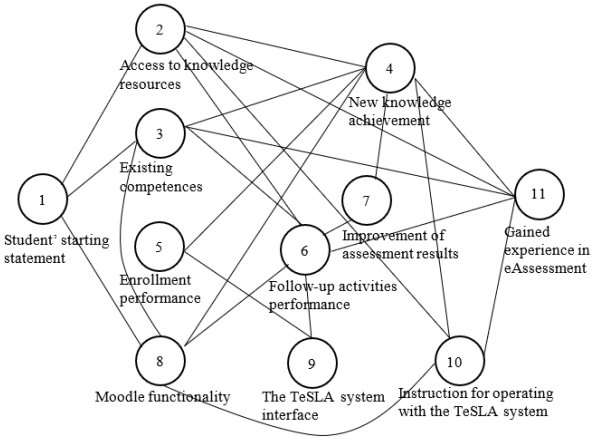


Fig.1. Path net

Triangular membership function is used with fuzzy numbers ranges from 0 to 8. The arcs' length is evaluated by authors according to their experience in the TeSLA pilot and it is presented in Table 1.

TABLE 1. LENGTH OF ARCS IN FUZZY NUMBERS

Arc	Length		Arc	Length		Arc	Length		Arc	Length
(1,2)	(1,2,3)		(1,3)	(1,2,3)		(2,6)	(3,4,5)		(9,10)	(4,5,6)
2,4)	(3,4,5)		(3,2)	(1,2,3)		(2,10)	(5,6,7)		(9,5)	(1,2,3)
(4,11)	(6,7,8)		(3,6)	(1,2,3)		(2,11)	(6,7,8)		(5,6)	(4,5,6)
(4,8)	(4,5,6)		(3,11)	(5,6,7)		(1,8)	(1,2,3)		(6,11)	(5,6,7)
(4,10)	(4,5,6)		(3,8)	(3,4,5)		(8,9)	(1,2,3)		(5,3)	(1,2,3)
(10,8)	(4,5,6)		(2,11)	(3,4,5)						

The applied algorithm is presented on Figure 2, following the described procedures in [11].

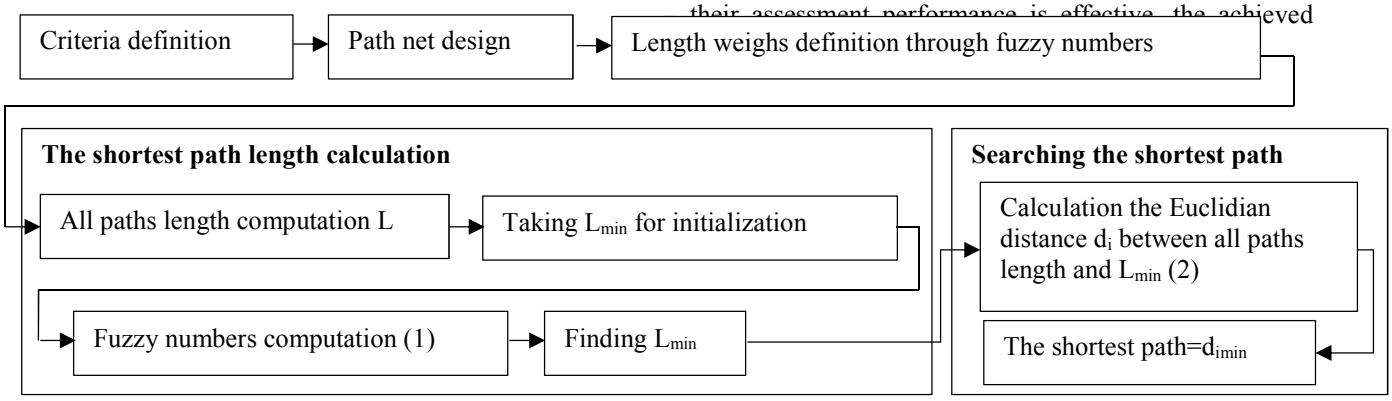


Fig. 2. Applied algorithm

Five paths with length $L_i(a,b,c)$, i=1,2,..,n are chosen as most possible for passing by unsupervised students and the minimal path L_{min} (a',b',c') is obtained:

P1:1-8-9-5-3-2-6-11; L1=(13,20,27); P2:1-2-3-8-9-5-6-11; L2=(16,23,30); P3:1-2-4-8-9-5-6-11; L3=(19,26,33); P4:1-2-4-10-8-9-5-6-11; L4=(19,31,39); P5:1-8-9-5-6-3-2-11; L5=(15,22,30).

The fuzzy numbers are calculated according to the following mathematical dependencies:

(1) $\boldsymbol{a = \min(a, a')}$

$$\boldsymbol{b} = \begin{cases} \boldsymbol{b, if \ \leq a'} \\ \boldsymbol{\frac{(bxb')-(axa')}{(b+b')-(a+a')}, if\ b > a'} \end{cases}$$

$$\boldsymbol{c = \min(c, b')}$$

and L_{min}=(13,7.18,23) is obtained.

Then, the Euclidean distance is calculated between the current path length and L_{min} applying the equation:

(2) $$\boldsymbol{d(L_i, L_{min}) = \sqrt{(a_i - a_{min})^2 + (b_i - b_{min})^2 + (c_i - c_{min})^2}}.$$

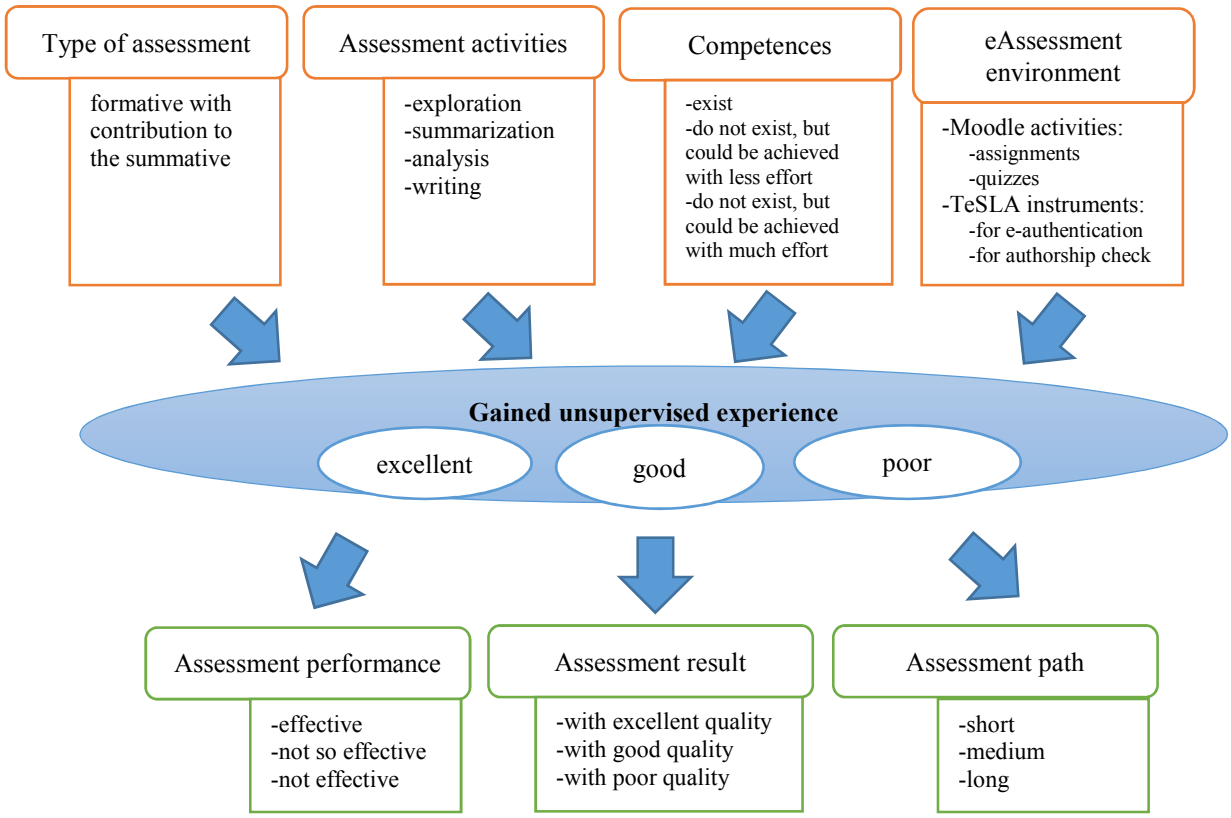
The received distances have the following crisp values: (L1,Lmin)=13.43; d(L2,Lmin)=17.56; d(L3,Lmin)=22.71; d(L4,Lmin)=29.32; d(L5,Lmin)=16.51.

It can be seen that the path P1 is the shortest path, because it has the smallest value of the Euclidean distance in comparison to the rest calculated distances. It is a possible solution for unsupervised students who possess competences to perform the enrolment and assessment activities in eAssessment environment, consisting of Moodle LMS and the TeSLA system. In other cases, the students' path from the starting point to the gained experience is longer and it depends on the needed knowledge, required instructions, performance effectiveness, design of assessment activities. On Figure 3 is presented the developed model for assessment of unsupervised students. It summarizes the literature review, performed analysis and authors experience during the third pilot of the TeSLA project. The gained students' experience we could classify in three groups:

(1) a group of students with excellent gained experience their assessment performance is effective, the achieved

(2) a group of students with good gained experience – their assessment performance is not so effective, it could be improved, the achieved result could be good or excellent and the assessment path is medium;

(3) a group of students with poor experience, because the assessment performance is not effective, the achieved result is with good or poor quality and the assessment path is long



Figu.3. Assessment model for unsupervised students

IV. CONCLUSION

The paper summarizes and analyses the findings obtained during the third pilot of the TeSLA project related to the gained unsupervised experience by students. Two assessment tasks were designed with aim to be performed at home by students without teacher's support. The results show that the detailed instructions related to Moodle and the TeSLA system functionality as well as the clear instructive material were in assistance of students. Among the most common difficulties was the lack of sufficient knowledge and understanding the characteristics of the system as well as the lack of required competences that led to the longer assessment paths. Anyway, all students-participants successfully performed their unsupervised assessment activities.

V. ACKNOWLEDGEMENT

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