

[DOI: 10.20472/TEC.2020.009.008](https://doi.org/10.20472/TEC.2020.009.008)

MUHAMMET BERIGEL

Faculty of Economics and Administrative Sciences, Karadeniz Technical University, Turkey

ONUR ADIYAMAN

Republic of Turkey Ministry of Economy, Science and Industry; Eastern Black Sea Development Agency, Turkey

HASAN KARAL

Fatih Education Faculty, Trabzon University, Turkey

ADNAN BAKI

Fatih Education Faculty, Trabzon University, Turkey

TANER ALTUN

Fatih Education Faculty, Trabzon University, Turkey

MERVE YILDIZ

Karadeniz Technical University, Trabzon, Turkey

FURKAN KALYONCU

Fatih Education Faculty, Trabzon University, Turkey

CONCEPTUAL FRAMEWORK OF ADAPTIVE WEB BASED SKILL ASSESSMENT TOOL DESIGNED FOR LOW QUALIFIED ADULTS IN TURKEY

Abstract:

In this study, it is aimed to compose a conceptual framework for literature and institutions which aims to create an adaptive assessment test for measuring skill levels of low-qualified adults. Determining the skill level of individuals to design and develop the adaptive assessment tools correctly and effectively is a very important step. The composed adaptive assessment model has mainly two parts; 1-) Demographic Features including General Demographics and Skill Based Demographics, 2-) Skill Based elements including literacy, numeracy, and digital skills. The conceptual framework creates an infrastructure to integrate sections of adaptive evaluation systems such as entry point, item pool, stopping rules, time issues, content sampling, exposure controls evaluation rules, test organization, scoring method and algorithm.

Keywords:

Conceptual Framework, Web Based Assessment Tool, Skill Assessment, Low Qualified Adults

JEL Classification: I21, I29, C51

1 Introduction

Determining the skills of individuals is very important both for planning a career for labor market and using the information to plan individualized learning (Klosters 2014). The most important challenges faced when planning work-oriented training for individuals by institutions such as business institutions, chambers of commerce and industry, public education centers is; planning trainings, ensuring quality and creating homogeneous learning environments (Andersen et al. 2015, Tikkanen et al. 2018). Evaluating the skills of individuals of different ages, creating individualized learning environments, monitoring, and analyzing education is a process that can be carried out by experts and institutions with the combination of many disciplines (Macias et al. 2018, OECD 2017). In this context, data science, statistics, research studies, educational science, information technologies, management etc. should be carried out together under a single roof. Higher education institutions can help the problems of the labor market through creating work-oriented education and employment with collaboration models and producing new approaches with experts from different disciplines (Assaad et al. 2018). One of the biggest problems experienced in vocational trainings created for the labor market is the lack of prior knowledge and skills competencies for the participants to receive training (Rususo et al. 2013). In order to reach the desired level in the trainings that individuals will receive in the business world such as; basic literacy, mathematics and digital skills should be sufficient, and they should be directed to vocational training once they have achieved the necessary qualifications. At this point, using effective tools to measure individuals' basic skills and create personalized learning environments is critical for individuals' professional and innovative education.

(Barker and Literacy 1999, Ramalingham et al. 2014). To achieve this, disciplines such as information technologies, education, science, assessment and evaluation, statistics, artificial intelligence, e-learning, and management need to be combined. In particular, the advances provided by information technologies and their features play a leading role in blending many disciplines together. Adaptive assessment systems and smart learning environments in particular provide, effective solutions for the evaluation of individuals and the creation of individual learning environments and reduce the problems experienced.

Skill tests are the main tool to get information and assume about adults' skills. Using a traditional test have several disadvantages for determining skills of low qualified adults correctly (Patsula 1999, Straetmans and Eggen 1998). Asking the same questions, long test times, asking questions in the same order, reduce the reliability and validity of the skill assessment test. Computer adaptive testing has become a well-accepted and efficient methodology for assessing skills and knowledge. Computer adaptive tests reduce the amount of test time, dynamically customize the flow of questions, and show a result with a minimum amount of questions based on the answers of each exam participant.

It is very important to analyze the design goals, current status, goals and possible scenarios of the design quality in detail before design and development processes in such tests (Dickson 2004, Barbosa et al. 2008).

In this study conceptual framework of web-based assessment tool for assessing the literacy, numeracy, and digital skills of low skilled/low qualified adults in Turkey was composed. Low

qualified adults were defined primary school graduate between the ages of 18-40. Demographic elements and Skill Based elements are two main part of system.

2 Composed Model for Adaptive Web Based Skill Assessment Tool Designed for Low Qualified Adults

It is very important to establish the conceptual and theoretical structure of the evaluation system to determine the skill levels of individuals (Booth et al. 2003). The qualifications that individuals should have during mandatory education and the qualifications expected from individuals in employment processes in today's business world are the main components that should be focused on, when creating the conceptual environment. To create a correct model, all factors that may affect the evaluation process, evaluation methods, target audience analysis and content analysis should be carried out in detail (Kravick et al. 2005). The aim of this conceptual framework and to create a model is to provide a strong foundation for institutions and researchers that can be used for assessing low skilled/qualified young adults.

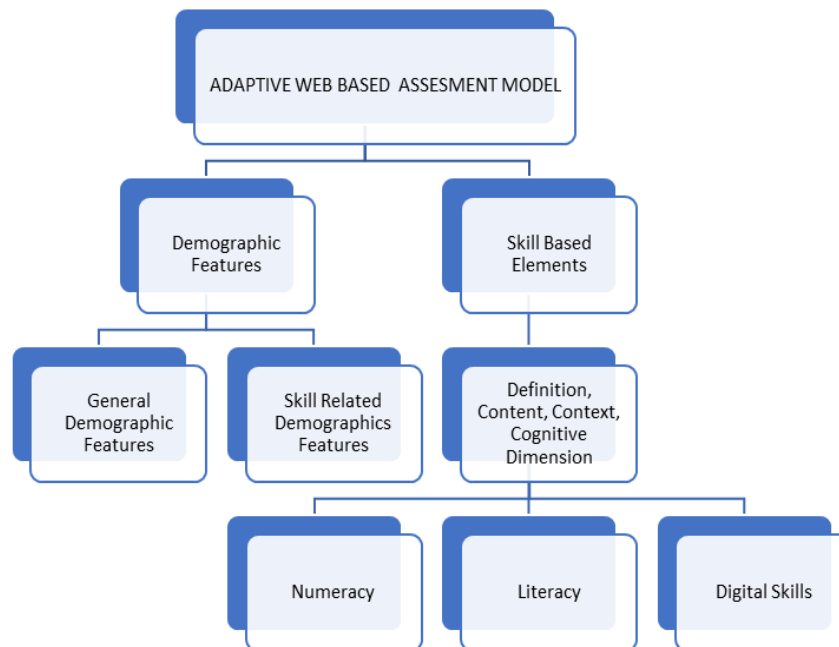


Figure1. Adaptive Web Based Assessment Model

In Fig. 1, it is seen that conceptual framework of Adaptive Web Based Assessment Tool. Adaptive assessment has two dimensions: 1- Demographic features, 2- Skill Based Elements. Demographics features were divided to two factors (Fig. 2): General Demographic Features and Skill Related Demographics Features. General Demographics has three subcategories, 1- Basic Demographics, 2- Educational Background, Work Experiences. Skill-related Demographic features consist of items related to each skill.

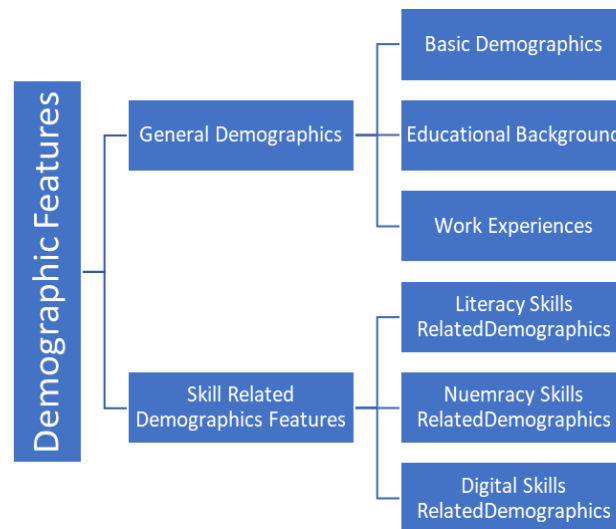


Figure 2. Demographic features of Conceptual Framework

Skill Based Elements (for literacy, numeracy, and digital skills) was performed including four factors: Definition, Content, Context and Cognitive Dimension.

Definitions: Firstly, Skill Based Elements are defined and the boundaries that constitute these elements are drawn in accordance with the national curriculum. Special definitions and properties of each skill area are specified.

Content: Considering the primary and secondary school curricula and the effects of these curricula on today's life, a content structure was created for each skill area.

Context: The areas, situations, and contents defined by the skills to be measured were determined within the scope of content and definitions.

Cognitive Dimension: The cognitive states related to the skill to be measured are determined and classified.

These four components are the main structures of the item pool. A strong conceptual framework should be drawn to create rules and hierarchy in adaptive assessment systems. The creation of the conceptual framework is considered the first stage of adaptive assessment systems (Chalhoub-Deville et al. 1996).

In this study a detailed conceptual framework was composed for each field. Literacy, Numeracy and Digital Skills. The conceptual framework of each skill area was created by experts as a result of literature reviews, detailed analysis of Turkish Education Systems, and Registration of Statistical Institutions.

Digital skills, 10 content subcategory, 4 Cognitive Dimension and 2 main contexts were composed.

2.1 Conceptual Framework of Turkish Literacy

Literacy Skills: 4 content subcategory, 11 Cognitive Dimension, and 4 main contexts were composed (Table 1).

Table 1. Conceptual Framework of Turkish Literacy.

Definition	Expressing and interpreting concepts, thoughts, opinions, feelings and facts both verbally and written (listening, speaking, reading and writing); to engage in linguistic interaction in all social and cultural contexts, such as education and training, workplace, home and entertainment (MEB, 2018 Communication Competence in Native Language)
Content	Listening/ Watching, Vocabulary, Understanding, Writing
Context	Personal, Workplace, Education, Social (entertainment, communication etc.)
Cognitive Dimension	Recognition, Explanation, Prediction, Comparison sorting, Classification, Integration, Application, Relationship building, Analyzing, Interpretation, Evaluation

2.2 Conceptual Framework of Turkish Numeracy

For Numeracy skills: 5 content subcategory, 5 Cognitive Dimension and 3 main contexts were determined (Table 2).

Table 2. Conceptual Framework of Turkish Literacy

Definition	Numeracy literacy is the ability of an individual to interact , access, use and interpret information in explaining a series of mathematical needs in their life. In other words, digital literacy is an individual's ability to interpret qualitative and numerical data, establish a time-space relationship, solve problems, and perceive the surrounding world correctly using judgement and decision-making processes.
Content	Measuring, Estimation and calculation, Recognizing and using verbal / symbolic expressions, Graphic reading and interpretation, Problem solving
Context	Business-related skills, Personal abilities, Skills related to society and social life. etc.
Cognitive Dimension	Knowledge, Understanding, Application, Evaluation, Formation

2.3 Conceptual Framework of Digital Skills

Digital skills, 14 content subcategory, 6 Cognitive Dimension and 2 main contexts were composed (Table 3).

Table 3. Conceptual Framework of Digital Skills

Definition	Digital skills are defined as "the various capabilities that individuals are expected to have in using digital devices, communication applications, and networks to access and manage information." It enables people to create and share digital content, communicate and collaborate, and produce effective and creative ways of solving life, learning, work and social activities.
Content	The Importance of Information Technologies in Daily Life, Computer Systems, File Management, Ethical values, Digital Citizenship, Privacy and Security, Computer Networks, Communication Technologies and Collaboration, Word Processor Programs, Presentation Programs, Spreadsheet Programs, Audio and Video Processing Programs, Problem Solving Concepts and Approaches, Programming
Context	Business-related skills Personal abilities
Cognitive Dimension	<p>Knowledge: Knowing, recognizing, remembering, reciting</p> <p>Comprehension: Information assumption, estimating, assimilating, translating, adapting to other examples.</p> <p>Application-reflection: Solving a new problem, reaching solution, making transactions, making calculations, adapting to the situation</p> <p>Analysis: Dissecting the whole, finding relationships, analyzing, revealing similarities and differences</p> <p>Synthesis: Combining elements according to certain rules, creating a new whole, developing original ideas, producing something unique</p> <p>Evaluation: Criticizing, judging, appreciation, discussing conclusions, summarizing according to internal and external criteria.</p>

3 Conclusions

Creating a conceptual framework for web based adaptive testing systems is one of the most important part of designing process and ensuring reliability and validity of systems. The aim of this study is to create a conceptual framework suitable for literature and institutions for adaptive skill assessment test for low qualified adults in the fields of literacy, arithmetic, and digital skills.

Constructing a strong conceptual framework will have a big contribution for integrating parts of adaptive assessment systems such as entry point, item pool, stopping rules, time issues , content sampling, exposure controls assessment rules, test organization, scoring methods and algorithms(Chalhoub-Deville at all, 1996, Kravcik at all, 2005).

Based on the skill scores obtained from the web-based adaptive evaluation system, individual training will be provided with e-learning technologies in a smart learning environment. At this point, well-organized and consistent adaptive evaluation is an important step, because

determining the skill levels of low-skilled people makes it easy to provide appropriate feedback to all participants in the system.

This and similar assessment and learning models focusing low skills adults can be used in commercial entrepreneurship, social entrepreneurship, creativity and vocational training required by today's labor market.

4 Acknowledgement

Authors are grateful to project contract Number: VS/2019/0127 receiving financial support from the European Union programme for employment and social innovation "easi" (2014-2020). For further information please consult: <https://onlinebeceri.com/en/>

References

- Andersen, T., Feiler, L., & Schulz, G. (2015). "The role of employment service providers: guide to anticipating and matching skills and jobs", Vol. 4. Publications Office of the European Union, Luxembourg.
- Assaad, R., Krafft, C., & Salehi-Isfahani, D. (2018). "Does the type of higher education affect labor market outcomes? Evidence from Egypt and Jordan", *Higher education*, 75(6), 945-995.
- Barker, K., & Literacy, B. C. (1999). "The Electronic Learning Record: Assessment and Management of Skills and Knowledge A Literature Review", Literacy BC and the National Literacy Secretariat, Vancouver.
- Barbosa, H., Garcia, F., & Rodriguez, M. (2008). A tool for online assessment in adaptive e-learning platform. In *Proceedings of the eUniverSAL Conference*, Virtual, Salamanca, Spain.
- Booth, R., Clayton, B., Hartcher, R., Hungar, S., Hyde, P., & Wilson, P. (2003). The development of quality online assessment in vocational education and training. *Australian Flexible Learning Framework*, 1(1), 17.
- Chalhoub-Deville, M., Alcaya, C., & Lozier, V. M. (1996). An operational framework for constructing a computer-adaptive test of L2 reading ability: Theoretical and practical issues. Center for Advanced Research in Language Acquisition.
- Dickson, M. (2004). Achieving quality in building design by intention. *Designing Better Buildings: Quality and Value in the Built Environment*, 185.
- Esichaikul, V., Lamnoi, S., & Bechter, C. (2011). "Student modelling in adaptive e-learning systems" *Knowledge Management & E-Learning: An International Journal*, 3(3), 342-355.
- Fernández-Macías, E., Gómez, E., Hernández-Orallo, J., Loe, B. S., Martens, B., Martínez-Plumed, F., & Tolan, S. (2018). "A multidisciplinary task-based perspective for evaluating the impact of AI autonomy and generality on the future of work", *Artificial Intelligence (cs.AI); Computers and Society (cs.CY)*, arXiv preprint arXiv:1807.02416.
- Kravicik, M., Angelova, G., Ceri, S., Cristea, A., Damjanović, V., Devedžić, V., ... & Henze, N. (2005). *Requirements and Solutions for Personalized Adaptive Learning*.
- MEB. (2018). *Türkçe dersi öğretim programı (ilkokul ve ortaokul 1, 2, 3, 4, 5, 6, 7 ve 8. sınıflar)*. Ankara.
- OECD (2017). "In-depth analysis of the labour market relevance and outcomes of higher education systems: analytical framework and country practices report, enhancing higher education system performance"
- Patsula, L. N. (1999). "A comparison of computerized adaptive testing and multi-stage testing", *Doctoral Dissertations 1896- February 2014*.3282.

- Russo, G., Bainbridge, S., & Dunkel, T. (2013). "Benefits of Vocational Education and Training in Europe for People, Organisations and Countries. Cedefop-European Centre for the Development of Vocational Training", PO Box 22427, Finikas, Thessaloniki, GR-55102.
- Ramalingam, M., Kasilingam, G., & Chinnavan, E. (2014). "Assessment of learning domains to improve student's learning in higher education", *Journal of Young Pharmacists*, 6(1), 27.
- Straetmans, G. J., & Eggen, T. J. (1998). "Computerized adaptive testing: What it is and how it Works", *Educational Technology*, 38(1), 45-52.
- Tikkanen, T., Hovdhaugen, E., & Støren, L. A. (2018). "Work-related training and workplace learning: Nordic perspectives and European comparisons", *Journal International Journal of Lifelong Education*, Vol. 37, Issue. 5