

Question Types for Assessment of Mathematics Education in Dynamic Geometry Environments

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Abstract

Assessment of student learning requires the use of techniques for measuring student achievement. Assessment is more than a collection of techniques, however. It is a systematic process that plays a significant role in effective teaching. It begins with the identification of learning goals, monitors the progress students make toward those goals, and ends with a judgment concerning the extent to which those goals have been attained [1]. In the literature, the integration of technological tools into the assessment process is expressed by the “e-assessment” concept [2,3,4]. Assessment using ICT has come to be known as e-assessment, which includes the entire assessment process, from designing assignments to storing the results with the help of ICT [4]. The most of the researches related to the e-assessment focused on how to transfer the examinations in paper-pencil environment to the electronic environment [3,4]. In addition to those studies, in the research about the integration of computer assisted assessment tools to the mathematics instruction, the participant pre-service teachers use these tools in favor of the formative assessment [5]. In a similar study, pre-service teachers prepared lessons and home works using technological tools such as dynamic geometry software and thus it is shown that those tools can be used in the process of assessment [6]. In the literature, there is numerous studies concerning technology supported mathematics instruction [7,8,9,10]. But none of them is related to the assessment dimension of the mathematics teaching. In particular, it is highly recommended to conduct researches about the use of technology in that dimension [5,11,12]. The aim of this study is to determine question types that can be used for assessment of computer based mathematics instruction. Case study is considered as the methodology of the research. The reason is that a case study investigates a contemporary phenomenon in depth and within its real-life context when the boundaries between phenomenon and context are not clearly evident [13]. 15 pre-service mathematics teachers have participated to the study of 6 weeks (3 hours per week). Every pre-service teacher worked individually on totally 26 geometry questions of different types. At the same time, they explained their approaches to solve problems by filling out a paper. In addition, a screen capture program is used to grab the video of what is seen on the computer screen. Meanwhile the researchers observed pre-service teachers’ work on computers. The findings of the study are revealed via the analysis of each video, of their comparison with the written explanations and of the researchers’ observations. Based on the findings, the most significant result of the study is that open-ended geometry problems reflect students’ knowledge better than other types of questions. Moreover, all types of questions should be used in order to assess students’ learning performance.

REFERENCES

- [1] M. D. Miller, R. L. Linn & N. E. Gronlund “Measurement and assessment in teaching” 10th edition, Pearson Education, USA.
- [2] D. Arthur Pead. (2010). “On computer-based assessment of mathematics”, Unpublished doctor of philosophy thesis: University of Nottingham.
- [3] M. Ferrão. (2010). E-assessment within the bologna paradigm: evidence from Portugal, *Assessment & evaluation in higher education*, 35:7, 819-830

- [4] U. Stödberg (2012). A research review of e-assessment, *Assessment & Evaluation in Higher Education*, 37:5, 591-604.
- [5] H. Akkoç (2012). Bilgisayar destekli ölçme-değerlendirme araçlarının matematik öğretimine entegrasyonuna yönelik hizmet öncesi eğitim uygulamaları ve matematik öğretmen adaylarının gelişimi, *Turkish Journal of Computer and Mathematics Education*, 3(2), 99-114.
- [6] R. Uğurlu. (2009). Teknolojik pedagojik alan bilgisi çerçevesinde önerilen eğitim programı sürecinde öğretmen adaylarının şekillendirici ölçme ve değerlendirme bilgi ve becerilerinin gelişiminin incelenmesi. Yayınlanmamış Yüksek Lisans Tezi, Marmara Üniversitesi
- [7] M. Artigue. (2002). Learning mathematics in a CAS environment: The genesis of a reflection about instrumentation and the dialectics between technical and conceptual work. *International Journal of Computers for Mathematical Learning*, 7(3), 245-274.
- [8] M. Filiz (2009). Geogebra ve cabri geometri II dinamik geometri yazılımlarının web destekli ortamlarda kullanılmasının öğrenci başarısına etkisi, Yayınlanmamış yüksek lisans tezi, Karadeniz Teknik Üniversitesi.
- [9] S. Habre & M. Abboud (2006) Students' conceptual understanding of a function and its derivative in an experimental calculus course, *The Journal of Mathematical Behavior*, Volume 25, Issue 1, , Pages 57-72
- [10] İ. Kepceoğlu (2011). Geogebra Yazılımıyla Limit ve Süreklilik Öğretiminin Öğretmen Adaylarının Başarısına ve Kavramsal Öğrenmelerine Etkisi, Yayınlanmamış Yüksek Lisans Tezi, Marmara Üniversitesi
- [11] A. Baki (2008). Öğrenen ve Öğretmenler için Bilgisayar Destekli Matematik. İstanbul: Ceren Yayıncılık
- [12] W. William (2010). Classroom-based evaluations of teacher instruction, *Assessment & Evaluation in Higher Education*, 35:3, 152-173.
- [13] R. K. Yin, "Case study research: Design and methods" 4th edition, (Applied social research methods, vol 5) SAGE Publication, USA.