ASSESSMENT OF STUDENT LEARNING IN CLOUD-BASED INSTRUCTION

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Abstract. The beginning of the of the 21st century has been marked with an unprecedented technological development which has changed the way we communicate, live and understand information [Fischer, 2005]. Modern classrooms are equipped with instructional technology that allows educators to integrate traditional approaches with Cloud affordances or to entirely deliver their instruction in the Cloud. The growing number of technology-enhanced classrooms and courses requires consequent modifications in the assessment of student learning since assessment is an integral component of course design [Brown, 2010].

The purpose of this article is to describe and illustrate the use of SaaS (Software as a Service) technology in the assessment of student learning in a Cloud-based course for teaching academic writing to IT majors at the Faculty of Mathematics and Informatics at Plovdiv University "Paisii Hilendarski". Particularly, the article focuses on the add-on tool Flubaroo that runs with Google Forms and Sheets. It discusses the benefits of Flubaroo in view of the five universal principles of good assessment: *validity*, *reliability*, *authenticity*, *washback* and *practicality*. The discussion is illustrated by specific examples from multiple-choice items created on Google Forms and scored and graded by Flubaroo. Item statistics produced by Flubaroo highlight problematic multiple-choice questions that need to be either revised or removed from the test. Low-scoring and high-scoring students are also identified by color-coding. This data provides insights that can be used to improve the reliability and validity of the tests or quizzes.

Flubaroo enhances the authenticity of tests because they are delivered on a platform that is favored by young people who are used to working in digital environments. The washback is also improved due to the interactive nature of the tool. The test-takers receive their scores, feedback and answer key via email. Exercising these effective practices gives them an opportunity to learn from their errors in an unobtrusive way [Watt, 2002].

Last but not least, Flubaroo frees teachers from long hours of grading and allows them to focus more on the development of the tests and subsequent revisions based on the item statistics. In this way it increases the practicality of assessment because the time devoted to scoring and grading is reduced. This benefit is of significant importance for assessment of big-size classes. Moreover, it also contributes to increased reliability because it minimizes the risk of scoring errors typical of human raters.

All of the above benefits of Flubaroo are illustrated by examples and relevant screenshots. Cyber security issues are also outlined alongside limitations of online assessment tools that can only be overcome by the expertise and active involvement of the instructor.

Keywords: cloud-based assessment of learning, multiple-choice items, principles of assessment in technology-based testing, Flubaroo

1. Technology-enhanced teaching and assessment

The affordances of the Internet and technology have hugely influenced and altered the way we teach, learn and transmit knowledge. The integration of effective teaching practices, combined with technology-enhanced instruction, provide opportunities for creating student-centered interactive environments for learning.

Subsequently, this has led to a change in the roles of teachers and learners in the modern classroom. Present-day students, referred to by Prensky as the "digital natives", find information quickly and easily since they have grown up with technology and "speak" its language free of an accent [Prensky, 2001], [Prensky, 2006]. On the other hand, the teachers as "digital immigrants" must shift gears in order to keep up with the fast pace of the new generation of students [Prensky, 2006]. "Digital immigrants", who "speak" the language of technology with an "accent" have to get in sync with the needs of the Net Generation [Tapscott, 2008] or the YouTube Google-Eyed Generation [Duffy, 2008] in the 21st century. In a technology-enhanced world information does not come only from the teacher [Lamb, 2004], to the contrary – it is available on the Internet, free of charge and can be easily accessed.

Technology is no longer an "ad-on" to instruction, but rather a prerequisite for constructive and effective educational practices. Studies have provided evidence that when integrated appropriately, technology can boost student performance and learning [Георгиева, 2011], [Шотлеков, 2014], [Charkova, 2014] [Charkova, 2016]. Nowadays, technology is an essential part of course design and pertains to all its components: *course content, teaching materials, teaching methodology* and

assessment. This is particularly relevant to Cloud-based course design, where all four components should be adjusted to meet the requirements of a virtual environment.

Since the focus of this paper is on the digitalization of assessment, the other three components of course design will not be discussed here. The first important point to be made is that a lot has been done in integrating assessment with technology. Specialized software programs have been developed to aid instructors in designing, developing, generating, scoring, and evaluating tests. Some examples of contemporary tools for digital generation of tests were created in the Faculty of Mathematics and Informatics at Plovdiv University "Paisii Hilendarski" [Rahnev, 14], [Rahneva, 2004], [Rahneva 2008]. These programs offer an efficient and effective support for developing reliable and valid testing instruments.

However, not all such software programs are easily available to the average teacher, who needs a simple, accessible and free tools to assist them in developing Cloud-based testing. A key factor in choosing one particular software over another is functionality. A teacher would be more effective at introducing something familiar to students, which incorporates all the necessary SaaS tools to build a course entirely in the Cloud.

Google offers opportunities for constructing an entire Cloud-based course free of charge. Applications such as YouTube, Gmail, Google Sites, Docs, Sheets and Forms all contribute to the creation of a learning platform set up in a virtual environment. A useful tool in Google sheets is Flubaroo. It serves as a grading instrument, which in the same time provides statistics about a given quiz or test which can be used to improve the quality of the items.

2. General description of Flubaroo

As it was mentioned earlier, Flubaroo is an ad-on in Google sheets which serves as a grading tool for checking multiple-choice and fill-in-the-blanks tests. It shows the number of submissions, computes an overall mean score and mean score per question. Flubaroo also shows the maximum possible score and a grade distribution graph. It flags low scoring questions and low scoring students. Furthermore, Flubaroo gives the option of emailing individual grades and the answer key to each student (or parent).

Before one can use Flubaroo, it is important to have a Google account which allows the use of Google Drive. Google Forms are an application on Google Drive, which are used to create tests and surveys in various formats such as short answer, paragraph, multiple-choice, checkboxes, drop-down and several types of linear scales. However, only multiple-choice or fill-in-the-blanks questions can be scored by Flubaroo. Tests can be shared with students by posting them on a Google Site or through a sharable link.

Once all students have submitted, the test is ready to be scored. This is when the ad-on Flubaroo is activated. It takes under a minute for the system to produce the scores and item statistics. The teacher should then assign a specific grade to the scores and send back emails with the score, grades and answer key. As a final stage, all feedback related to the item statistics should be reviewed for improvement of subsequent versions of the test. The sequence of steps that should be followed by users of are summarized on Table 1.

Step 1	Create a test
Step 2	Create an answer key
Step 3	Share the test
Step 4	Receive responses
Step 5	Score it
Step 6	Assign grades to scores
Step 7	Share grades and feedback

Table 1. Grade with Flubaroo in 7 Steps

As a whole, Flubaroo helps increase test quality in view of the 5 main principles of assessment, an issue discussed in the next section.

3. Flubaroo and the 5 principles of assessment

Regardless of the format, the medium, the cultural context and specific educational setting, assessment tools should be developed in compliance with the five universal principles of assessment [Bachman, 2010], [Brown, 2010]: reliability, validity, authenticity, practicality and washback.

3.1. Reliability

Reliability refers to the consistency and precision of an assessment tool in measuring a particular construct [Brown, 10]. Item statistics produced by Flubaroo highlight low-scoring questions by color-coding. The statistics are especially relevant in the case of questions that have been missed by the high scoring students. Instructors should revisit such questions and critically examine the directions, correct answers, and distractors. It is highly possible that a low scoring question missed by good students has more than one correct answer. Such items should be revised and improved or removed from future administrations of the test. The process can be repeated until all test items produce consistent results, where low scoring questions are associated with low scoring students, and *not* with high scoring students. Figure 1 illustrates a screen shot of test statistics and color-coded items/questions on Flubaroo.
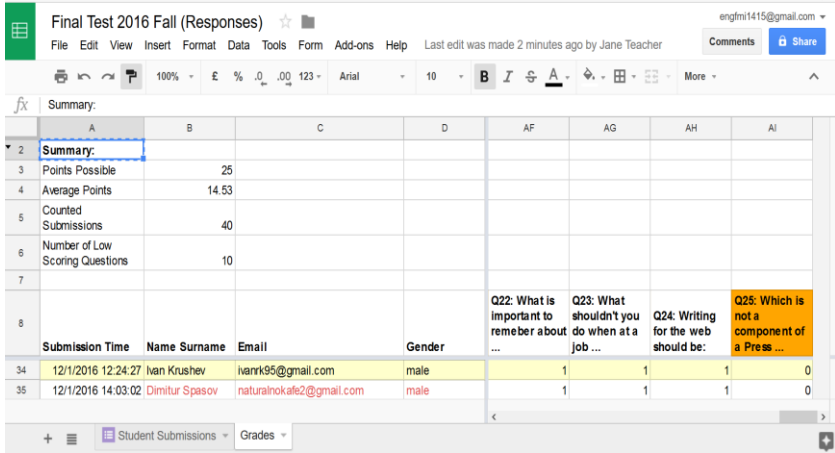
Figure 1. Test statistics in Flubaroo

3.2. Validity

Validity is an essential principle in assessment and refers to the accuracy and relevance of the assessment tool. It is best explained in relation to the question: *Does the assessment tool measure what it is intended to measure in an accurate way?* [Bachman, 2010], [Brown, 10]. Instructors who adhere to the principle of validity, make sure that tests and quizzes contain items related to the content that was taught and practiced in the course of study. They try to include a representative number of items for each objective. In this sense, validity is greatly dependent on the instructor's expertise in the subject matter and in assessment. No software can compensate for a poorly developed test which have low relevancy to the academic content. Yet, test statistics can also used to improve the validity of test items.

For example, when Flubaroo flags an item as very difficult, that is low scoring, this means that very few students have answered such an item. The instructor can review the item critically and identify the reason for the high difficulty. It often happens that such items test issues that have not been covered and practiced in class or have only vaguely been mentioned but not brought to the attention of the students. Such items should be removed from the test and replaced with items that have higher relevancy to the course objectives and content.

3.3. Authenticity

This principle concerns the question: *Does an assessment tool measure real-life skills and competencies?* [Bachman, 2010], [Brown, 10]. Flubaroo enhances the

authenticity of tests by providing a platform that is favoured by young people who are used to working in digital environments. It creates a familiar environment for students and motivates them to perform their class tasks diligently. However, it should be mentioned here that the authenticity of test content is entirely in the hands of the instructor. The authentic digital platform provided by Flubaroo cannot compensate for contrived items that have no relevancy to what students need to know in order to perform at their future jobs. Figure 2 contains a picture of an online testing environment which has great authenticity to learners who have grown up in a technologically advanced world.

Figure 2. Authentic testing platform

3.4. Practicality

Practicality is the principle of assessment that every teacher understands well. It refers to a valuable, although intangible entity - time. This includes: time spent in creating tests, time for administering tests, time to determine scoring criteria and/or rubrics, time for scoring and grading [Bachman, 2010] [Brown, 10]. Flubaroo offers several affordances that can save teachers' time. The first advantage is that it takes less time to create the test with the help of specialized software which eases the effective formatting of the items. The second and most important advantage is that Flubaroo frees teachers of scoring time since it does the job for them. It also generates and summarizes test results and illustrates them graphically. All of these functions allow teachers to spend less time in creating and scoring tests. They provide opportunities for learning from the test results and improving the quality of test items.

3.5. Washback

Washback refers to the effect of assessment on students' learning [Bachman, 2010], [Brown, 10]. It addresses the question: *Does assessment promote learning or vice versa?* Flubaroo allows teachers to increase the effect of washback through the

use of its interactive functions. For example, the test-takers receive their scores, feedback and answer key via email. This gives them an opportunity to learn from their errors in an unobtrusive way. Figure 3 contains a screenshot of Flubaroo's easy platform for sharing scores, grades, and feedback with students regarding test results.
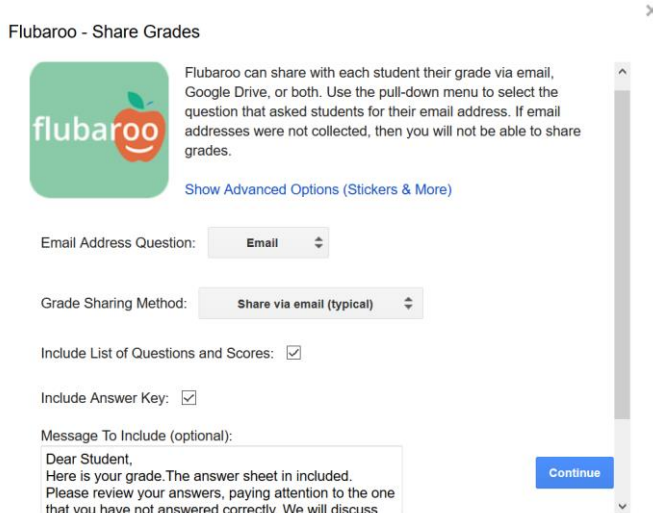

Figure 3. Sharing grades and providing feedback

4. Conclusion

Technology offers enormous and various opportunities for improving the reliability, validity, authenticity, practicality, and washback of assessment. Flubaroo is just one example of the growing role of technology in assessment practices. However, technology also has its downsides. As far as assessment is concerned, the greatest challenge is presented by the difficulty to control cheating, especially in distance learning education. Technology also offers solutions such as monitoring students' activities via specialized software, controlling test time, using the "shuffle function" or in other words different versions of the same test.

The effective integration of technology in assessment is greatly dependent on teachers' preparedness to use specialized software programs. This means that they need to receive training in technology-based teaching and assessment in order to become confident users of course and assessment developing tools. Good assessment requires expertise, planning, time, development, and continuous evaluation and revisions. No software can replace a competent teacher; it can only assist in the process of creating effective materials.

Acknowledgements

References

[1] Георгиева Г., *Използване на електронното портфолио на учещия в процеса на обучение*. Международна конференция „Електронно, дистанционно … или обучението на 21 век", София, 2011, 46–55.

[2] Шотлеков И., Д. Шаркова, Подходът Обучаеми обучават обучаеми в Облака. (04) – Първи етап, *Списание „Педагогика"*, бр. 86, книжка 4, 2014, ISSN 0861-3982.

[3] Bachman L., A. Palmer, *Language Assessment in Practice*. Oxford: Oxford University Press, 2010.

[4] Brown H. D., P. Abeywickrama, *Language assessment*: *Principles and classroom practices*. White Plains, NY: Pearson Education, 2010.

[5] Burke S. C., S. L. Snyder, YouTube: An Innovative Learning Resource for College Health Education Courses, *International Electronic Journal of Health Education*, 2008, 11, 39–46.

[6] Charkova D., K. Boykova, V. Ivanova, V., *YouTube in Foreign Language Aquisition: What generation Web 2.0 want*. Pamporovo, 2016, ISBN 978-954-8852-72-2.

[7] Charkova D., I. Shotlekov, *Challenges of teaching written communication in the Cloud*. Сборник доклади на VII национална конференция „Образованието и изследванията в информационното общество", 29–30 май 2014, Пловдив, 284–292.

[8] Duffy P., Engaging the YouTube Google-Eyed Generation: Strategies for Using Web 2.0 in Teaching and Learning. *Electronic Journal e-Learning*, 2008, The Hong Kong Polytechnic University, Hong Kong, 6 (2), 119–130.

[9] Fischer G., S. Konomi, Innovative media in support of distributed intelligence and lifelong learning, *Proceedings of the Third IEEE International Workshop on Wireless and Mobile Technologies in Education,* Los Alamitos, CA: IEEE Computer Society, 2005, 3–10.

[10] Lamb M., 'It depends on the students themselves': independent language learning at an Indonesian state school, Language, *Culture and the Curriculum*, 2004, 17, 2293–10245.

[11] Prensky M., Digital natives, digital immigrants, *On the horizon*, 2001, 9 (5), 13–102.

[12] Prensky M., Listen to the natives, *Educational Leadership*, Dec 20053–Jan 2006, 63 (4), 8–13.

[13] Rahnev A., N. Pavlov, V. Kyurkchiev, *Distributed Platform for e-Learning – DisPeL*. European International Journal of Science and Technology (EIJST), Vol. 3, No. 1, 2014, 953–109, ISSN 2304-9693.

[14] Rahneva O., A. Rahnev, N. Pavlov, Functional Workflow and Electronic Services In a Distributed Electronic Testing Cluster – DeTC, *Proceedings 2nd International Workshop on eServices and eLearning*, Otto-von-Guericke Universitaet Magdeburd, 2004, 1473–157.

[15] Rahneva O., A. Golev, N. Pavlov, Dynamic Generation of Testing Question in SQL in DeTC, *Cybernetics and Information Technologies*, Vol. 8, No. 1, 2008, 73–81.

[16] Tapscott D., *Grown Up Digital: How the Net Generation is Changing Your World*. HC, McGraw-Hill, 2008, ISBN 0071508635.

[17] Watt S., C. Simpson, C. McKillop, V. Nunn, Electronic course surveys: Does automating feedback and reporting give better results?, *Assessment & Evaluation in Higher Education*, 2002, 27 (4), 325–337.

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ОЦЕНЯВАНЕ НА ЗНАНИЯ ПРИ ОБУЧЕНИЕ БАЗИРАНО В ОБЛАКА

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Резюме. Началото на 21-ви век се характеризира с невиждано досега технологично развитие, което променя начина, по който живеем, комуникираме и усвояваме информация [Fischer, 2005]. Съвременните класни стаи са оборудвани с технологии, които позволяват на преподавателите да интегрират традиционни подходи с възможностите предоставени от интернет пространството и да изнесат обучението в Облака. Поради нарастващия брой дисциплини, използващи технологии се изисква и оценяването, като основен

компонент във структурата на всеки курс, да бъде виртуализирано [Brown, 2010].

Целта на тази статия е да опише и илюстрира приложението на SaaS (софтуер като услуга) технологии в процеса на оценяване на знания на студенти, записани в курс по писане на английски език в Облака при Факултета по математика и информатика към ПУ „Паисий Хилендарски". По-конкретно, статията се концентрира върху използването на Flubaroo, като инструмент на приложението Google Sheets. Разглеждат се предимствата на Flubaroo с оглед на петте основни принципа на оценяването: *валидност*, *надеждност*, *автентичност*, *обратна връзка* и *практичност*. Илюстрирани са чрез конкретни примери на въпроси с множествен отговор, създадени на Google Forms и анализирани от Flubaroo. Статистическите данни помагат да се идентифицират проблемни въпроси, които или трябва да се редактират или премахнат от теста. Освен това, програмата маркира в определен цвят обучаеми, които се справят под или над средното ниво. Тези данни предлагат допълнителна информация, която може да бъде използвана за подобряване на надеждността и валидността на тестови изпитвания.

Flubaroo подобрява и автентичността на теста, като го изнася в пространство, познато и предпочитано от съвременните обучаеми. Обратната връзка също е подобрена поради интерактивния характер на инструмента. Студентите получават резултатите си, обратна връзка и отговорите на теста по електронна поща. Приложението на тези ефективни практики им дава възможността да учат по приятен и ненатрапчив начин [Watt, 2002].

Не на последно място, Flubaroo освобождава преподавателите от дълги часове в оценяване на тестове. Вместо това се създава свободно време, в което те могат да развиват и подобряват следващи версии на теста, базирани на статистическите данни, предоставени от Flubaroo. По този начин се увеличава практичността на оценяване, защото времето отделено за проверка и оценка е значително редуцирано. Това предимство е от изключителна важност при оценяване големи на брой групи. Освен това, надеждността нараства, понеже се минимализира риска от човешка грешка при оценяването. Всички предимства на Flubaroo са илюстрирани нагледно с примери. Очертани са също проблеми, свързани с кибер сигурността, заедно с някои органичния на онлайн оценяването, които могат да бъдат отстранени с опита и активното участие на преподавателя.