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Olga Trendak
University of Lodz, Poland
trendak@interia.pl
https://orcid.org/0000-0001-6488-7956

Computer-assisted assessment: Application of computerised testing at the Institute of English Studies at the University of Lodz, Poland

ABSTRACT
Numerous researchers have noticed the need for better measurement of students' stated learning outcomes (Conole & Warburton, 2005). One of the reasons is the increasing number of university students, which has led to the necessity of finding an efficient form of assessment. One of the ways of testing, which is rapidly gaining popularity among academic staff, is computer-assisted assessment (CAA). The aim of the following paper is to briefly discuss the notion of CAA and the observed positive impacts it has exerted on the testing process at the Institute of English Studies at the University of Lodz, Poland, and to consider several pedagogical implications related to the use of this type of assessment within the institution. The findings were observed by the author of the paper and are not based on empirical data.
Keywords: computer-assisted assessment, computer assisted testing systems, computerised testing, computer-based assessment, ICT

1. Introduction

Within the past few decades one can notice a considerable upsurge in the use of technology in higher education. Given the fast pace of today's world, such a situation no longer seems surprising. In fact, it could be said that technology has become an indispensable component of many university classes. E-learning, blended learning, countless learning applications, multimedia and online learning tools – all of these prove how the face of higher education has altered over the past decades and gained a fresher look. Therefore, it only seems natural that more and more universities have called for the implementation of computers in the process of students' learning and final assessment. The ever growing use of computers in higher education seems inevitable. Fuentes et al. (2014) add that:

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> Due to the rapid […] development of ICT (Information and Communication Technologies) in the last few years, e-learning has become a fully consolidated reality in the vast majority of higher schools and universities around the world. In the US, for example, over 6.7 million university students took at least one online course in 2012 […]. In Spain, meanwhile, almost 90% of universities have an institutional e-learning platform and over 60% of the traditional on-site courses use it as an additional learning resource (p. 977).

There are several advantages resulting from the use of computers when examining students. Thurlow et al. (2010) talk about efficient administration, student preference, improved writing performance and immediate results (2010, p. 1). Conole and Warburton (2005) stress the following positive aspects: a considerable reduction of the assessment load and the innovative form of assessment – one of the many advantages of CAA which will be elaborated on in further parts of the article.

The following paper aims at discussing the concept of CAA and presenting the advantages resulting from the introduction of computerised testing at the Institute of English Studies at the University of Lodz, Poland. Mention will also be made of the limitations and challenges faced by students and also academic staff responsible for the running of computer-assisted assessment.

2. Defining computer-assisted assessment

Bull & McKenna (2004, p. 1) define CAA as "the use of computers to deliver, mark and analyse assignments or examinations. It also includes the collation and analysis of optically captured data gathered from machines such as optical mark readers (OMRs)". Apart from optical mark readers Conole & Warburton (2005) also mention portfolio collection, which means that a computer is used to collate students' scripts or written work.

Researchers point out that CAA is often referred to as computer-based assessment. The notion of CBA stands for the implementation of a computer program responsible for marking the answers generated by students and fed into the system. In computer-based assessment students are expected to complete their examination at workstations and then their answers are automatically marked by the system (Bull, 1999). Optical mark reading, on the other hand, relies on a computer to capture answers from surveys, questionnaires, multiple-choice questions that were completed on paper. When describing CBA, Conole and Warburton (2005) point out that it can be further divided into stand-alone applications which need only one computer, applications that can easily function on private networks and, finally, applications that can be used within public networks, for instance the web.

Bull and McKenna (2004) mention other terms which are closely connected with computer-assisted learning, for instance: computerised assessment, compu-

ter-aided assessment or web-based assessment. The two last terms fall into the category of screen-based assessment. CAA is frequently applied to objective test questions, such as true/false or multiple choice.

Looking at the numerous, at times quite complex terms associated with CAA might initially lead to some degree of confusion or even distrust among academics and students. However, as Bull and Danson (2004) add, "while the terminology – and individual interpretations of it may vary, the underlying strategies and practices for making effective use of computers for student assessment remain constant" (p. 3). In practice CAA can be applied for different purposes, for instance to generate exam questions including, among others, multiple choice, true/false, matching or transformations. Moreover, thanks to this way of testing, students can take their exams on computers or on other mobile devices. Most importantly, though, CAA allows for automated grading, which helps teachers save considerable amounts of time which can be devoted to other tasks.

At this point it is vital to discuss the three aspects of CAA – it can be summative, formative or diagnostic. As far as the first category is concerned, the main aim is to guarantee quantitative grading. Bull and McKenna (2004) mention some examples of summative assessment, such as end-of module exams or graded coursework. The researchers add that it can also include feedback provided to the student. The aim of summative assessment is to "summarize the level of competence the student achieved at the end (or at a certain point) of the learning process by means of a particular grade or certification" (Fuentes et al. 2014, p. 977). This way academic teachers instantly see students' achievement in a given subject.

Formative assessment, on the other hand, is aimed at providing students with detailed feedback which could later help them progress (Mackenzie et al., 2004). Fuentes et al. (2014) define it as systematic action intended to

> provide feedback to the student on their progress and identify weaknesses and gaps to be corrected. […] the emphasis […] is to provide the student with written or oral feedback from the teacher rather than a numerical mark (p. 976).

Formative assessment gives the students a chance to see how well they have progressed with regard to their understanding and knowledge of a given subject. It can be "monitored by the tutor, used purely for self-assessment, or used to contribute marks to a module grade" (Bull & McKenna 2004, p. xiv).

Finally, diagnostic assessment refers to the process of evaluating students' prior knowledge at the beginning of the semester or academic year. The aim is to provide the lecturer with information about what the students already know in terms of skills or the content of the course that they want to join.

3. Computer Assisted Testing Systems (CATS)

Every semester, at the end of their Integrated Skills class (a class in Practical English), undergraduate English philology students at the Institute of English Studies sit a computerised exam. In order to pass, students need to receive a satisfactory mark in all of the following components: speaking, reading, writing, use of English and listening. The tasks students have to perform include, among others, multiple choice, transformations, open close and multiple matching. Before 2010 students took their Practical English exam once a year, which negatively impacted how systematic they were. The coordinator of the subject decided to introduce more frequent assessment at the end of every semester. CATS were introduced at the Institute in 2015. Before that time, all the tests, apart from the oral one, were paper-based. The introduction of a computerised form of assessing students' knowledge has revolutionized the whole process of exams at the Institute of English Studies and dramatically reduced the administrative load on the academics.

Prior to mentioning any tangible benefits resulting from the application of computerised tests, mention should be made of the system per se. CATS comprise 2 separate tests: a placement test and also a computerised Integrated Skills test for BA students. The former is administered at the beginning of the BA program, while the latter at the end of each semester. The placement test was first used in 2012 and has been modified three times since then. So far, more than 1200 students have successfully taken the test, including Erasmus and Mobility Direct students.

The Integrated Skills test is a computerised version of the pen and pencil test and includes all the Skills and Functions components, apart from the speaking test. The introduction of CATS was preceded by a pilot test in 2015, which made it possible to detect any possible flaws in the system and react accordingly. One of the changes introduced to the test is providing the students with the opportunity of approaching the test in any sequence that may be more comfortable or suitable for them. They can also go back to previous questions as many times as they want. This way, the computerised version bears a close resemblance to the pen and pencil test.

Once the students save their tests, the system automatically counts their points. The key is constructed in a way which makes it possible to keep track of students' answers and add any new items that students managed to create themselves. Additionally, students have access to the test only within the Institute (intranet). Every student receives their own unique login and a password for each session once they enter the examination room. The site administrator is immediately informed about any attempts to log into the exam session from outside the Institute.

It is worth mentioning that the Institute of English Studies at the University of Lodz, Poland, is the first institute in the country to have introduced such a form

of examining English philology students. Hence, there is a need to promote this system and encourage other institutes to follow suit as there are significant benefits connected with its use. Literature on the subject of computerized test, after a period of skeptical initial reviews some twenty to thirty years previously, abounds in accounts of numerous benefits that seem to fall in several broad categories. Firstly, expedience in deployment and issues of testing ecology and economy are discussed in almost every account of computerized and computer based assessment (Bachman, 2000; Russell & Haney, 2000; Chalhoub-Deville, 2001; Galaczi, 2010). Process control, insights into examiner and examinee testing behaviours are then often mentioned (Bunderson, Dilkon & Olsen, 1989; Schegel & Gilliland, 2007) with security and confidentiality (Russell & Haney, 2000) and research opportunities (Scheuermann & Guimarães Pereira, 2008; ITC, 2005) as additional avenues worth exploring.

3.1. Benefits of CAA at the Institute of English Studies

The Computer Assisted Testing Systems at the Institute of English Studies at Lodz University, or CATS for short, is a system consisting of several interrelated sub-systems. The front-end CATS interface for student-test interactions is the portion of the system immediately visible to students, and several back-end modules for the development, management and scoring provisions are the backbone of the system.

The work with the system begins with the exam manager creating a new exam and defining levels and types of tasks within the exam. With this accomplished, the manager then assigns developers from amongst the teaching staff to write particular exam tasks through the developer module of CATS with e-mails immediately notifying them of their role in the pending exam. Subsequently, other staff members are assigned the roles of markers and raters, while some others are appointed as exam monitors. One of the first merits resulting from the implementation of CAA can be observed before students embark on their classes. Those who wish to complete their BA program at the Institute of English Studies at the University of Lodz are asked to complete a placement test that automatically assigns them to the right level of their Integrated Skills class. There are six levels depending on the students' level of linguistic advancement. The students are allowed to complete their tests at home; however, they are informed that any attempts at cheating will result in being placed in a group which might be too challenging and too advanced, which, in turn, might lead to failing the course.

Prior to the introduction of computerised versions of the placement test, students were asked to come to the university before the beginning of the academic year and complete a paper-based test. This meant that several academic teachers were obliged to provide assistance during the process of testing and marking, which was extremely time-consuming. Another disadvantage was the fact that there were some students who did not take the placement test. Hence, they were

asked to take the test at a different time, which necessitated additional staff supervising these students.

One of the salient and practical advantages of using computerised testing, as reported by Kearney et al. (2004, p. 235), is that it allows for an economic use of time and also to test "a large student cohort with the facility of automated marking of responses". Since the introduction of CATS at the Institute of English Studies, the process of administering and, most importantly, marking hundreds of exam papers has become much smoother and faster. Academic teachers no longer need to devote long hours to marking piles of exam papers. Additionally, the risk of making a mistake has been considerably reduced (Marriott & Toeh, 2012). The right answers are fed into the system and the computer corrects students' papers according to the provided key. The only two components that need to be assessed by the academic teachers are writing and speaking. Previously, teachers were asked to collect students' writing and mark it by hand. Now, they can do so with the help of a specially designed computer program, which allows them to provide each student with constructive feedback which they can later use to improve their writing.

The tool is called Script Assist®, and it comprises a portion of the software available to the examiners under the examiner portion of the CATS. It provides the script marker with a set of functions to annotate the script, comment and mark the script on a pre-selected scale or set of scales. One portion of the screen is afforded to the script and script annotation tools, and the other holds the performance descriptors broken down into categories with additional space for comments for each category. Needless to say, markers are encouraged to provide exhaustive comments to justify their choices.

It should also be stressed that teachers can access students' writing from the comfort of their own home, which was not possible a few years ago. All they need to do is log in and they automatically receive access to their set of students' essays. As for oral exams, students are assessed by two examiners who evaluate their performance according to a set of specified criteria. The format of the spoken exam has not been changed. Students enter the examination room, draw their questions, produce a monologue and then engage in a dialogue. As yet, there have been no plans to computerize this part of the Practical English Exam, even though considerable effort is expended to provide digital assessments to this area of the test. Apart from mock exam sessions organized prior to the main event, the Speaking Paper is a traditional face-to-face exam, where the students are assessed by two raters in the presence of a third administrator taking care of paperwork. The mock exams, however, are digitally registered and fed into an EPSS (Electronic Performance Support System) for training purposes (Krakowian, 2015). As observed by academic teachers and the authorities of the Institute of English Studies at the University of Lodz, owing to CAA, the process

of testing students has become more organized and efficient. This is in part due to managing student flow and examiner duties and responsibilities via a coherent examiner portion of the system, but also through process control mechanisms that are available through easily affordable test statistics, with information on exam performance feeding into different stages of the examination procedure. Test statistics include such classical (CTT) indices as facility value (FV) and discrimination indices (D1-3 and point biserial DI), as well modern, logic-based examiner-test interaction statistics (MTT).

The exam session usually starts at the very beginning of June. There are two days devoted to Practical English exams – the first day starts with computerized testing. On the second day students take their spoken exam. All the testing is carried out at the Institute. After accessing the CATS in one of the designated computer labs in the building, students receive one time access codes which they use to access their exams. The whole procedure takes no more than a few minutes. Once the students log into the system, they have two hours to complete the exam which is comprised of four parts: use of English, writing, reading and listening. Also, computerised tests have helped to reduce instances of cheating, as reported by exam supervisors. Students take their exams in small rooms, which facilitates meticulous supervision. Additionally, students are mixed up according to their levels. It might happen that there will be students who attended module 1, 3 and 5 in the same room. Hence, it is virtually impossible to copy another students' paper.

Automating the process of scoring students' exam papers makes it possible for the students to obtain their test results much faster (Marriott & Toeh, 2012). Bull and Danson (2004, p. 5) point out that "automated marking is highly desirable from both the point of view of the educator, and if students are properly informed about the capabilities and benefits of the CAA – the learner". Hence, academics do not need to engage in the time-consuming process of repetitive and manual scoring of all the exam papers. Students also receive extensive feedback from the examiners on their written work – not only with regard to the number of points they score for their essays but also constructive comments on how well they did. Students have a chance to see which areas they still need to work on and which they excel in. Although this information was earlier available in pen-and-paper editions of the test, access to it was limited to the times when the papers were made available for inspection at designated times and under teacher supervision. Now, the scripts can be viewed both in the faculty building and from the comfort of the students' homes alongside other data on the student performance in the CATS exam. Summary data and data relating to performance in individual portions of the exam is also digitally available to the student. Mention should also be made of the fact that the introduction of computerised testing provides abundant and, most importantly, easy access for the academic teacher data that could be used to learn more about the students and to monitor their progress in a more thorough

way. The system stores the scores from every part of the exam which can later be meticulously analyzed, especially when compared to the students' final grade obtained in the Practical English class. This way, academic teachers can take on a more personalized approach to each student and place greater emphasis on the components that still need to be improved. In addition to this, Bartram (2006) says that thanks to the application of computer software, examiners see how long it took the student to complete the test and whether they changed their answers during the exam.

Finally, one cannot forget about the financial aspect of implementing computerised testing. Since its introduction in 2015, CAA has helped to save a considerable amount of money that would normally be devoted to printing exam papers. Every year there are around 300 students taking their end-of-semester exams in Practical English at the Institute of English Studies. Each part, excluding speaking and writing, comprises at least 3–4 sheets of paper. Hence, thanks to computer-assisted assessment the Institute has managed to reduce paper usage and storage (Marriott & Toeh, 2012). Summing up, one can see that the costs of each exam session are very high. Introducing computer-assisted assessment has profoundly impacted the Institute's budget helping to save money by transferring the exams to virtual reality.

3.2. Challenges associated with CAA

Despite all the advantages resulting from the application of computerised testing, there are certain shortcomings that also merit further discussion. To start with, creating and implementing CAA can be incredibly time-consuming. In fact, it might initially take even longer than preparing pen and pencil exams (Bull & McKenna, 2004; Marriott & Teoh, 2012; Fuentes et al., 2014). In course of time, however, the benefits become much more tangible.

It goes without saying that the team responsible for the whole process need to be knowledgeable and able to react quickly in case of technical problems (Bull & McKenna, 2004; Boeve et al., 2015). It is essential that there is an exam coordinator allocated to each examination room before the test begins. Such a person, or even a team, should meticulously monitor hardware and software to guarantee that the assessment runs smoothly. One of the problems arising at the very beginning of the exam are log-in problems. Although students receive their separate log-in details for the exam, it sometimes happens that they experience difficulty accessing their papers as the system rejects their password. What is more, computers are liable to crash or to hang. Networks can suddenly fail to work for no obvious reason. Hence, it is necessary that there is an additional person in each examination room who could successfully address these technical issues.

In one of her articles on CAA in higher education institutions (HEI's), Bull (1997) mentioned cultural and organisational barriers. Although the presence of

computerised exams at university level is more widespread than ever before there is still a certain degree of reluctance on the lecturers' and, even more surprisingly, on students' part. Not all academics are ready to adopt technology in their everyday practice. This unwillingness might result from the already considerable workload. Taking on even more duties such as familiarizing themselves with the exam format and preparing new tasks that could be included in the exam might seem like a daunting prospect to some academics. This is why it is vital that lecturers receive sufficient technical support from the coordinator of the exam.

Prior to the introduction of, first the online learning platform and, then, computerised tests, academic teachers running Integrated Skills classes at the Institute of English Studies were provided with extensive training in using the new learning tool and also in CATS. The training sessions took place at the University but also included online materials that teachers could access from the comfort of their home. During the training in computerised testing academic teachers learnt about the different modules of CATS. The first one was the student's module. Teachers could see what the exam looks like from the perspective of the student and what tasks they need to complete. The second one was the developer's module. Teachers were instructed how they can contribute to the already existing bank of exam tasks that can be used in future exam sessions. There is also the examiner's module used for assessing students' exams. Since reading, listening and use of English are automatically assessed by the computer, teachers only assess students' written work.

It is not only academic teachers but also students who need to get acquainted with the new exam format, otherwise they may experience anxiety (Marriott & Teoh, 2012). Prior to the implementation of CATS in 2015, all the students were invited to participate in a voluntary mock exam. The main aim was to guarantee a smooth transition from pen and pencil tests to computer-based exams, to help students become more familiar with the new format and, ideally, resolve any possible doubts. It should be mentioned that some students were far from enthusiastic at the prospect of changing the form of the exam. Some of them voiced their scepticism as they feared that the new exam could adversely affect their final grade as, in their opinion, they lacked the necessary IT skills, an issue that will be addressed in further parts of the article.

3.3. Pedagogical issues

When discussing the possible dangers pertaining to online assessment, Brown et al. (1997) mention the notion of cognitive conflict. The term refers to a situation in which students are obliged to perform online tasks during the course but then are asked to sit paper-based examinations. In other words, testing students in one system and training them in another is simply not fair and should be avoided at all costs. Ehrman (1998) also places emphasis on integrating not only the structure

but also the delivery of the course with the introduction of new technology as only this can guarantee effective CAA.

At this point it should be stressed that students at the Institute of English Studies are trained in online tasks on a regular basis. During the semester they are asked to actively participate in activities that appear on Moodle, a learning platform. The online tasks created by academic teachers include, among others, joining online discussions and presenting one's point of view on a given topic, completing multiple choice questions based on the materials covered, doing multiple matching or open cloze exercises. The tasks that students complete closely correlate with those that appear in the exams. Hence, students are provided with sufficient exposure to the types of exercises they will have to do during the exam session. Such practices are necessary if the institution implementing CAA wants to ensure a smooth running of the assessment process. In fact, there have been several studies investigating online quizzes and their impact on students' academic performance. As Kılıçkaya (2017, p. 61) reports, researchers have shown a great deal of interest in students' attitude to online quizzes (Lu, 2009; Dumova, 2012; Dashtestani, 2015; Arora et al., 2015) but also in the influence of quizzes on students' academic achievement and preparation for the classes (Galizzi, 2010; Kibble, 2011; McDaniel et al., 2012; Brown & Talon, 2015). The findings showed that online quizzes exerted a positive impact on students' attitudes to these assessment tools and also increased the subjects' motivation and achievement.

In their work on computer-assisted assessment, Bull & McKenna (2004) also raise the issue of information technology (IT) skills. Most students who enter university already possess a set of IT skills. Therefore, it is crucial to make sure that CAA places more emphasis on students' knowledge and understanding of the material to be tested rather than on their ability to correctly apply IT skills. In practice this means test designers should bear in mind that the exam tasks should be easy to complete even by students who do not feel confident when using computers. Thomas and Milligan (2003) stress that it is students' knowledge that should be tested and not their ability to click on the right buttons. This again leads us to the necessity of exposing students to exam-like tasks during the course, which would certainly provide them with more practice opportunities and help them gain the necessary IT skills.

Thought must also be given to the fact that mere application of computers in the process of testing university students is not enough to significantly improve their learning. Fuentes et al. (2014) call for a careful design of the examination and the need for formative feedback. In other words, transferring pen and pencil tests to virtual reality may prove to be an insufficient way to help students to become more proficient. Conole and Warburton (2005) call for the investigation of the new forms of evaluation which might result from the application of new technologies. This might mean gradually moving away from the beaten track and

slowly implementing new forms of exercises or activities that will be included in end-of-semester examinations.

4. Conclusion

The aim of this article has been to elaborate on the observed advantages and disadvantages pertaining to the application of computerised testing at the Institute of English Studies at the University of Lodz, Poland. Despite the several limitations or dangers connected with computerised testing, it seems that the advantages clearly outweigh all the disadvantages. Providing it is used correctly, CAA can be a powerful tool for student learning, building new activities into assessment and reducing marking time (Bull & McKenna, 2004, p. xiv).

As observed by the authorities of the Institute, the coordinators of the Practical English exam and the academic teachers supervising the exam session, including the author of this paper who has been running the course in Integrated Skills for the past ten years, the Institute has benefitted greatly thanks to the application on the new testing system from a financial and organizational perspective. Academic staff are no longer deluged with pen and pencil tests waiting to be marked. Another advantage is that the risk of making a mistake while scoring a significant amount of students' work has also been eliminated. Not only did it allow academic staff to regularly monitor their students' progress, thanks to more frequent assessment, but it also made the whole process smooth and efficient.

The application of CAA at any higher institution should be preceded by a comprehensive analysis regarding the costs, technical support, forms of training for academic staff and students, procedures and methods of its implementation. Bull and McKenna (2004, p. 9) also point to the need for high level coordination which is required of academic teachers, support staff, administrators and computer services. It should be borne in mind that, initially, introducing CAA might be time-consuming and costly, however, in time, these obstacles pale into insignificance compared to the benefits they produce. Clearly, there are several issues which need to be considered when administering computerised tests in future years to make online assessment at the Institute of English Studies as efficient as possible. The range of questions, sufficient technical support, students' and academic teachers' beliefs are only a few of these. However, it should be stressed that the existing system, with all its limitations, has turned out to be highly effective and has greatly facilitated students' summative and formative assessment.

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