

Szent István University, Faculty of Veterinary Science

Department Of Animal Breeding and Genetics.

The First Two Years of the GÁT System.

By

Lorna Moore.

Supervisor:

Dr. Ákos Maróti- Agóts

Budapest, Hungary,

2016

Contents

List of Abbreviations.....	3
1. Introduction	4
2. Survey of Literature.....	5
2.1 Literature about multiple choices.....	5
2.2 Literature about computer based exams.....	9
3. Materials Used	10
3.1 Description of GÁT system.....	10
3.2 Evaluation.....	10
3.3 Main pages of GÁT	11
3.4 Logging the access and results	12
4. Method.....	13
4.1 evaluation of test record.....	13
4.2 Surveys SM	15
5. Results	17
5.1 Excel results.....	17
2. How many times do students attempt a topic before their exam?.....	19
3. How many students sat the exam without practicing GÁT before hand?	20
4. When do students practice the GÁT System?.....	20
5	22
5.2 Survey Monkey Results.	24
6. Discussions	26
6.1 Discussions on Excel Data.....	26
6.2 Discussion on Survey Monkey results.	28
7. Summary	29
8. Conclusion.....	33
9. References.....	34
10. Acknowledgements.....	36

List of Abbreviations.

MCQ – Multiple Choice Questions

SAQ – Short Answer Question

SM – Survey Monkey

MC – Multiple Choice

MCT – Multiple Choice Tests

1. Introduction

The GÁT system is a computer based learning and testing system brought in to examine the students before the oral part of the exam. It is deemed a more objective way of examining a student. Allowing the student to practice as much as they deem fit before the exam. The GÁT programme is a study tool for the students. They have the opportunity to see all the questions and answers before the exam. GÁT is a way for students to revise on the information they were given in previous practical classes and lectures.

Computers are such a huge part of the world we currently live in. It was only a matter of time that students would study and be tested via computer programmes. The GÁT system gives a new and more practical way for students to test their knowledge on Animal Genetics and Breeding. The Animal Breeding and Genetics department are moving with the times we live in by incorporating the GÁT system into their teaching curriculum and examination method. A computer examination system is a quick and easy way to test students. It eradicates the use of paper, allow students to instantaneously receive their results, with no need for teachers to correct mounds of papers. It decreases the chance of cheating, with students getting random selection of objective testing results.

This thesis is to examine the current programme in place and to see how well it is working. What improvements are to be made?

Our aim is to describe exactly what the GÁT system is, the experiences and the problems and therefore to help improve the future developing of GÁT. To have a programme in place that maximises both the students learning and the amount of the curriculum that can be tested. The Breeding and Genetics department want to achieve a programme that give student a deeper understanding of the Animal Breeding and Genetics course. They want to eradicate memorising the unimportant information e.g. memorising the differences in the background of the photo, compared with memorising the breed differences. They also hope to minimise erratic guessing. It is important to have a system that creates an interesting yet very informative programme for the students to revise on, programme that will challenge the students to have a deeper understanding in the Breeding and Genetics field.

2. Survey of Literature

We, have researched into both multiple choice based testing and computer based learning. We have found overall an enthusiastic response to computer based learning and multiple choice testing.

2.1 Literature about multiple choices.

Simkin and Kuechler (2005) show the vast amount of pros to multiple choices (MC) testing such as, being machine gradable, thereby increasing scoring accuracy. Efficient way to collect and grade examinations from large numbers of test takers. Helps certification examiners agree on questions to ask a large number of test takers. Facilitates referencing the correct answer in textbook or other source. Perceived as an objective way to grade. Facilitates timely feedback for test takers in classes, and immediate feedback in web-based systems. Enables instructors to ask a large number of questions on a wider range of subject materials. Helps students avoid losing points for poor spelling, grammar, or writing ability. Easier preparation by test takers. Does not require deep understanding of tested material (student advantage). Reduces student anxiety.

Multiple versions of the same MC examination help thwart cheating. Helps avoid inconsistent grading of essays. Availability of computerized MC test banks, answers keys, and test generators. Test takers can increase the probability of guessing the right answer to a question by eliminating unlikely choices (student advantage). Electronic test items can easily be edited, pre-tested, stored, and reused. Simkin and Kuechler cite multiple choices testing not requiring a deeper understanding of the material. They claim that this can be an advantage to the student. Overall though this is not what the testers should be looking for. Simkin ask the question “If the relationship between student performance in MC questions and constructed response questions is imperfect, is it still close enough to enable faculty to rely on only MC tests when evaluating student understanding?” They claim that the answer is no, it is not close enough but with restricted budgets, larger class sizes, increased teaching loads that multiple choice testing might have to do.

In more research, Struyven et al, (2006) they found multiple papers agreeing with Simkin and

Kuechler's hypothesis. They found during their literature research that multiple choice questions or an emphasis on detailed factual answers push students towards a surface approach, while open, essay-type questions have the reverse effect and tend to encourage a deep approach. Students will attempt to understand the subject according to their perceptions of the assessment and will make a decision on whether to use a deep or surface approach. Yet in their own research they did not find this to be the case. In their study students performed better after preparing for a multiple choice examination. To say from this study multiple choice testing is more beneficial would be an oversimplification. Yet it does show that the earlier thinking, of multiple choice questions (MCQ)'s only offering a surface approach may not be correct.

More evidence of this is found, Walke et al, (2014) multiple choice questions were compared to short answer questions, by evaluating the performance of Medical Pharmacology students. Their findings show that MCQ'S are as effective as small answer questions (SAQ)'s in assessing the performance of the students. SAQ's requires the student to think and come up with a conclusion about the answer. It is not a chance phenomenon. Yet students have the opportunity to obtain some marks for a question if something can be answered. MCQ's Students must read the entire chapters being examined. To pick out the minute details and more importantly understand the concept to be able to correctly answer the question. MCQ's are easier and faster to answer. It can be easy to pick out the correct answer without remembering everything. Also a student who has not studied can still pass by guessing the correct answer.

Of course multiple choice questions as all assessment strategies have limitations (Brady, 2004) and application to some content more than others. Good MCQ's should be short and understandable; MCQ's can fulfil the criteria for effective assessment and integral component of the teaching and learning process and can assess performance in relation to the aims of the curriculum. MCQ's are efficient objective and easy to grade. They can be used to test a broad spectrum of the course.

Little and Bjork, (2015) Say that multiple choice tests are typically considered necessary evils in educational contexts, a form of testing only to be used when absolutely necessary. Their research found this reputation to be completely unwarranted, at least with respect to their use to promote learning. As tools of learning, properly constructed multiple choice tests, with

competitive answers are far from evil. They are effective. Especially for the learning of non-tested competitive information. During my literary research I have found a multitude of articles that confirm multiple choice testing is a very good way to examine students, if carried out the correct way. Using competitive answers, forcing the student to think about their answer. The pros of multiple choice testing can greatly outweigh the cons.

Douglas et al, (2012), multiple choice tests (MCT)'s have been widely used to replace or supplement problems, essays or oral questions. Their usage has increased notably due to the pressures of growing students' numbers, budget constraints and the subjectivity of constructed forms of assessment. MCT's allow for a reduction of assessment bias as the results can be measured more objectively than other forms of assessment. This has been made possible because the science of question design has become more efficient and respected as questions can be created specifically to test in-depth learning. The wider use and accessibility of computer networks and computerised test banks and quizzes also offer the benefit of instantaneous feedback, quicker compilation of grades and collation of results and tracking of students' progress throughout their course. Nevertheless, there are concerns about the educational limitations, validity, usefulness and reliability of this method, as MCT's may only measure and encourage students' ability to memorise or recall factual information rather than test higher levels of cognitive processes. They can also encourage guessing and feedback is limited and predetermined during test construction. The students' mindset, command of the language, experience and risk aversion may also influence the selection and interpretation of alternatives.

However, if designed properly, used in conjunction with other methods for example an oral exam as used in the GÁT system and where the educator defines the dimensions of understanding that need to be measured, the tests are as effective and reliable as essays in measuring comprehension levels.

Another Pro for multiple choice testing is that these tests can be carried out on web based programmes, as with the GÁT system. Many research papers have been carried out to see if computer based multiple choice testing really is an advantage.

Pawasauskas et al., (2014) Reviewed the implantation process transition to computer based testing their students and faculty perceptions of the software utility. The majority of students had a favourable response to the integration of the computer based testing in their course. Most students supported the use of the technology in their education and the majority felt comfortable using the software. Students liked receiving immediate feedback from the computer based testing and assessment of their progress. They noticed it decreased the likelihood of students cheating. Therefore, making the test fairer. In conclusion the implementation of the computer based testing software was straightforward and cost effective. Overall success of our transition was measured by student and faculty users which were favourable.

Multiple choice computer based testing clearly decreases the opportunity for students to cheat by showing up a different set of questions or in a different order. But is this random questioning a good thing or can it lead to an unfair examination.

Nelson and Cronje, (2008) carried out a study focused on the different test scores of students who were given more difficult questions to start with versus students who were given easier starting questions. The paper and pencil method allows students to look through all questions before deciding which one they would like to begin with computer testing gives no luxury. Some programmes allow for students to navigate back and forth but this can then cause time restraints.

There are some conflicting papers wrote on the retention time of computer based learning methods Digital Game-Based Learning in high school Computer Science education: Impact on educational effectiveness and student motivation. (Papastergiou, 2009) carried out a study to assess the learning effectiveness and motivational appeal of a computer game for learning. Although students were initially very enthusiastic about the game they quickly lost their interest. Also for long term retention of information the game was very time consuming. It was found very difficult to analyse long term retention.

Yang (2014) examined the improvements in learning among medical students, using a web based mnemonic system. The web based learning group subjects demonstrated improvements of 65%, 161%, and 208% compared with control group subjects on free-recall tests conducted

immediately, 1 week, and 1 month after study of materials, respectively. The results of performance on paired-matching tests showed an improvement of up to 331% for web based learning group subjects. The Web based learning group subjects also performed 55% greater than control group subjects on a 1 week delayed multiple choice test requiring higher-order thinking. The differences in test performance between the web based learning group subjects and the control group subjects were statistically significant and the web based learning group subject reported higher overall satisfaction with the material. The data of this pilot site demonstrate marked improvements in the retention of disease topics when using the web based learning method compared with traditional text-based materials. The use of the Web based learning method in medical education is supported by this paper.

2.2 Literature about computer based exams.

The GÁT system is not only an examination tool but also a learning site. Ebner and Holzinger, (2007) completed a study on Successful implementation of user-centred game based learning in higher education: An example from civil engineering. The objective to gain insight into what extent online games have to contributing to student learning in higher education. The findings were that the minimum learning results of playing the game were equal to that gained in the traditional method. Students enjoyed learning this way. They found to optimise learning and enjoyment, challenge and curiosity were most important. Other factors e.g. fantasy may be counterproductive to higher education. Playing this game leads to at least equivalent learning results as the traditional method there is no disadvantage for the learners who used this game. Playing this game on a voluntary basis feels like incidental learning. The online participants and those attending the lecture experience a divergence in the enjoy ability factor. Ease of use is a precondition for acceptance of the game. The game environment and the high score lead to increasing motivation i.e. the learner plays the game again.

3. Materials Used

The materials we have used to compile our research basis are the computer programme of the GÁT system itself. By looking at the website, pages and the questions in each topic we get an insight into what the GÁT system is. How we ourselves feel the results of our further research should be. We then use the log base of the GÁT system to create an excel work sheet. We also went directly to the students questioning them via a survey.

3.1 Description of GÁT system.

The GÁT system is a computer based learning and examining process for the practical part of Animal Breeding and Genetics course. Each student can log in individually using their Neptun codes and date of birth. Students practice by viewing a series of four photos and answering the question that accompanies them. They will be shown immediately which the correct answer is or else students have the option to flick through the pictures individually with a caption of what each photo is. Students can also test themselves on a series of photos and questions. Their results are posted as a percentage at the end of each test and they can review the correct and incorrect answers.

3.2 Evaluation

The practice questions and pictures are grouped according to species, tools, wool, teeth, markings, age determination, breeding marking calculation, parentage control etc. The test questions are also grouped likewise but a random selection of question from each section are shown varying from 5, 10 and 15 questions. In the official breeding and genetics practical examination students are given 28 question (2 random question from each topic) and 10 minutes to complete the exam. A failed practical exam means the whole exam is failed. If a student receives a grade of 4 or 5 in the practical exam, it is not necessary to repeat the exam in case of a failed theoretical exam.

Evaluation:

5:	25-28	90%	points	(Excellent)
4:	22-24	80%	points	(Good)
3:	19-21	70%	points	(Satisfactory)
2:	16-18	60%	points	(Pass)
1:	0-15	below	points	(Fail)

3.3 Main pages of GÁT

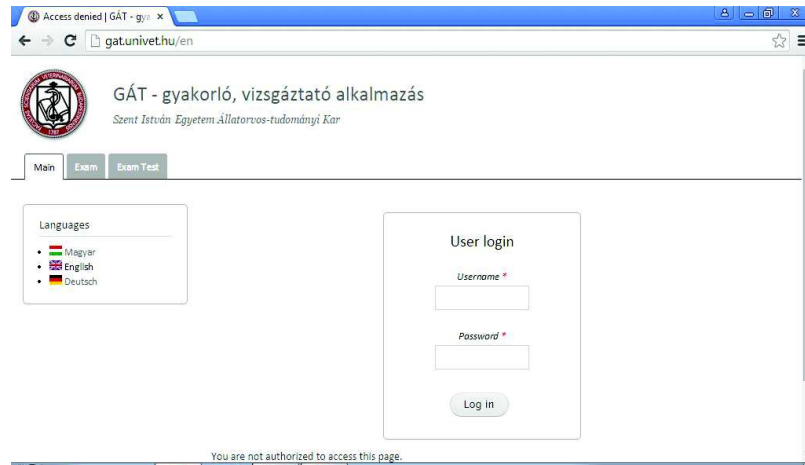


Figure 1 GAT log in page

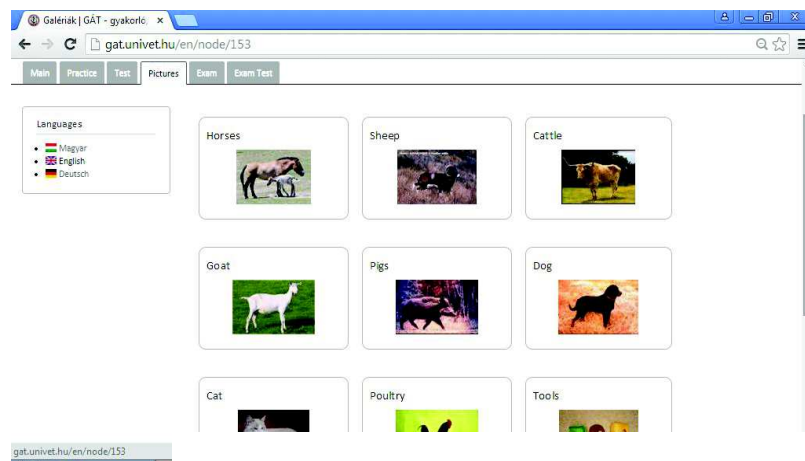


Figure 2 English Topic page of Animal Breeding Semester II

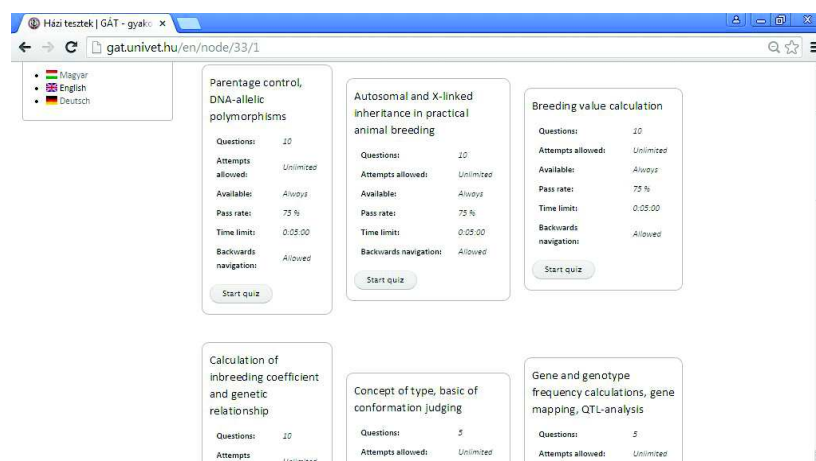


Figure 3 English Topic page Animal Genetics, Semester I

All students need to log into the GÁT programme using their neptun codes and personal passwords (Figure 1).The GÁT programme is a very clear and concise website. It is very user friendly.

3.4 Logging the access and results

All tests are logged to a plain text file on the server. The first year of the system recorded 33,838 tests carried out by the students.

The students can pick which semester they are studying for. Semester I- Animal Genetics exam, and Semester II – Animal Breeding exam. After selecting the semester the students can select the topic they want to practice or choose to do a practice exam.

4. Method

While researching my thesis, I used two main methods to analyse data. I created a survey and distributed it to all students who took part in the GÁT exam. I also analysed the data gathered from the GÁT programme itself. All the information of each student is collected under their neptun code. This information was inputted into an excel spreadsheet.

4.1 evaluation of test record

4.1.1 Data processing

4.1.1.1 The log file of GÁT processing

The log file has been the basis of our study. Each time a student logs in using their individual neptun code and password GÁT makes a record of it. These records are compiled into one data basis.

The log is plain text file, what we load into excel, and forming the record and field in it.

4.1.1.2 Anonymity

All results gathered in our data are anonymous. Each student is logged by their individual neptun log in code. We don't know who belongs to each code. Neither do other students.

4.1.1.3 The forming of the database in Excel

The data base of the Excel is logged as students Neptune code, topic number (shown below), start date and time of topic, end date and time of topic, and percentage result of topic.

Below are the topic numbers used in the GÁT system and the names in English, German and Hungarian. (Table 1)

Table 1: Topics and their numbers for the GÁT data log.

Number	English Topics	Hungarian Topics	German Topics
101	Lifetime and age determination	Élettartam és az életkor	Domestikation
102	Individual markings	Egyedi megjel	Kennzeichnungsmethoden, individuelle Identifizierung

103	Parentage control	Származásellenőrzés	Abstammungskontrolle
104	Autosomal and X-linked	Autoszomólis	Autosomale und X-gebundene Vererbung in der praktischen Tierzucht
105	Mol diagnosis	Molekuláris diagnózis	Erbkrankheiten
106	AI and MOET	Biotechnológia	KB und ET
107	EMT cloning	Biotechnológia II	Produktionstechnologien
108	Genotype frequency calculations	QTL-analízis	QTL-Analyse
109	Breeding value calculation	Tenyészérték számítás	Berechnung des Zuchtwertes
110	Genetic improvement	Genetikai előrehaladás	Genetische Fortschritt
111	Calculation of inbreeding coefficient and genetic relationship	Beltenyésztettség	Berechnung des Inzuchtkoeffizienten
112	Type, conformation judging	Küllemi bíralat	Fleisch- und Milchproduktion
113	Taking body measurements	VATEM	Grundlagen der Typ- und Exterieurbeurteilung
114	Milk and meat production	Has-tejtermelés	Milch- und Fleischproduktionsfähigkeit
201	Horse	Ló	Pferd
202	Cattle	Szarvasmarha	Rind
203	Wool	Gyapja	Wolle
204	Goat	Kecske	Ziege
205	Sheep	Juh	Schaf
206	Swine	Sertés	Schwein
207	Teeth	Fog	Zähne
208	Poultry	Baromfi	Geflügel

209	Cat	Macska	Katze
210	Dog	Kutya	Hund
211	Tools	Eszkozok	Werkzeuge
212			
213			
214			
215			
301	Understudy I. semester	Szemester I.	Semester I
302	Understudy II. semester	Szemester II	
303	HaH201 Exam	A vizsga	
304	Exam	A Vizsga	
	Understudy 2013		

4.1.1.4 Data mining in ACCES software

Using this info we are able to search for the data we need. We can search for certain results in the mass. We can test out theories using the data gathered. We can back up other findings by data mining.

4.2 Surveys SM

4.2.1 What is SM?

For making our surveys we used the website Survey Monkey. Survey Monkey is an online way to create and publish surveys. It allows you to customise your own survey. There is a choice of 15+ question types e.g. Yes/No questions, multiple choice, rating scale and comments. The survey can then be distributed to your target audience via mobile, web and social media. As soon as someone completes a survey the creator is notified via email. They can analyse the collected results on the website. The results for each question are shown with a visual bar chart and also with percentages and the exact numbers.

4.2.2 GÁT surveys

Our survey consisted of 10 questions.

- How long before the exam did you start practicing GÁT?
- What are the worst topics of GÁT?
- What are your favourite topics of GÁT?
- After receiving results of 100% in a topic, did you continue to attempt that topic?
- Did you find the GÁT system a good study tool?
- Did you find the GÁT system a good examination tool?
- How would you improve the GÁT system?
- Is the start time of the exam too early in the morning?
- In other courses would tests similar to GÁT be useful?
- Which courses do you think will benefit from a similar test and why?

I created a survey containing the same questions for the English, German and Hungarian course. The Survey consisted of 10 questions. I wanted to assess students favourite and least favourite topics. How often they studied in preparation for their GÁT exam. What their thoughts were on the system and how they would improve it.

4.2.3 Spread to the students

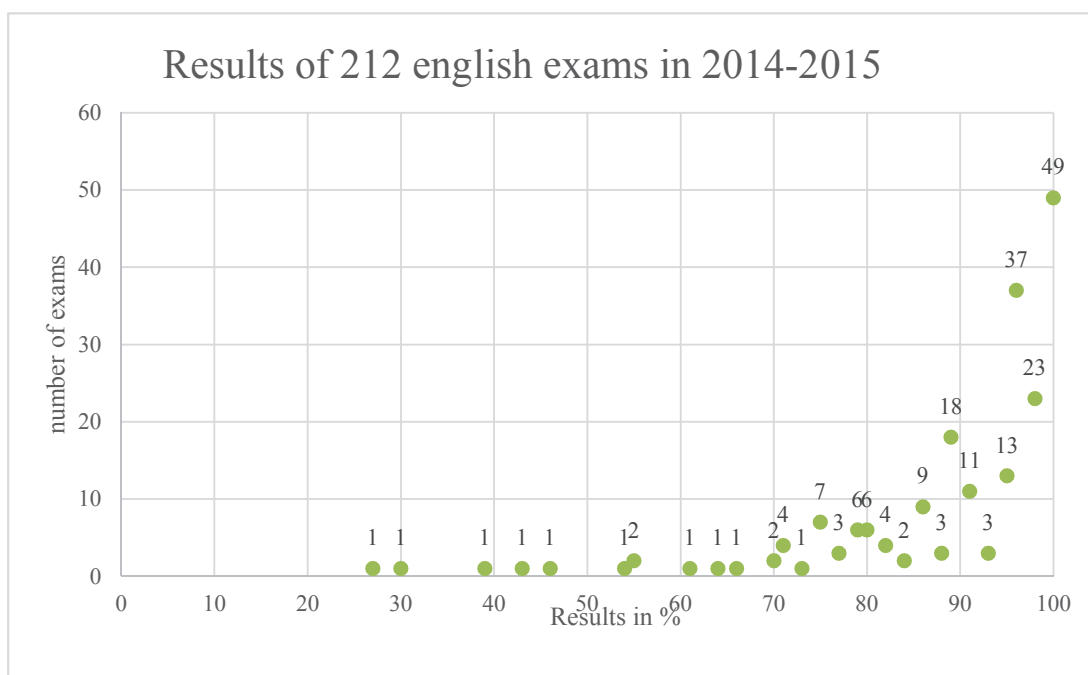
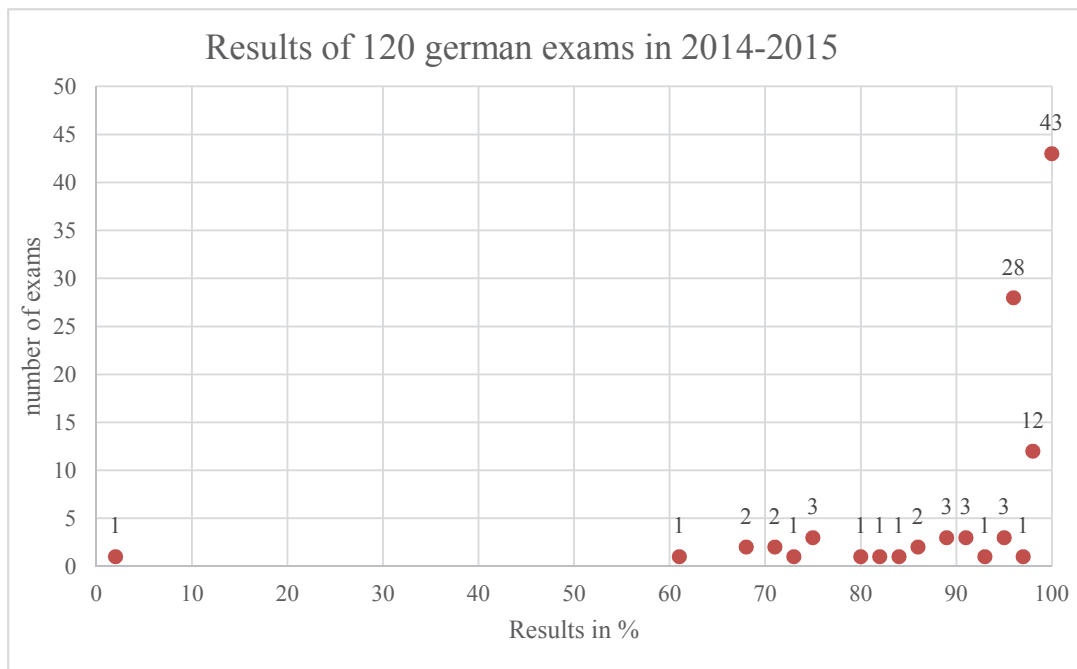
The survey was distributed to students of 3rd, 4th and 5th year who would have participated in the GÁT system. A link to the survey was emailed to each of the students via their class rep. The email also explained what the survey was about and why we were carrying it out.

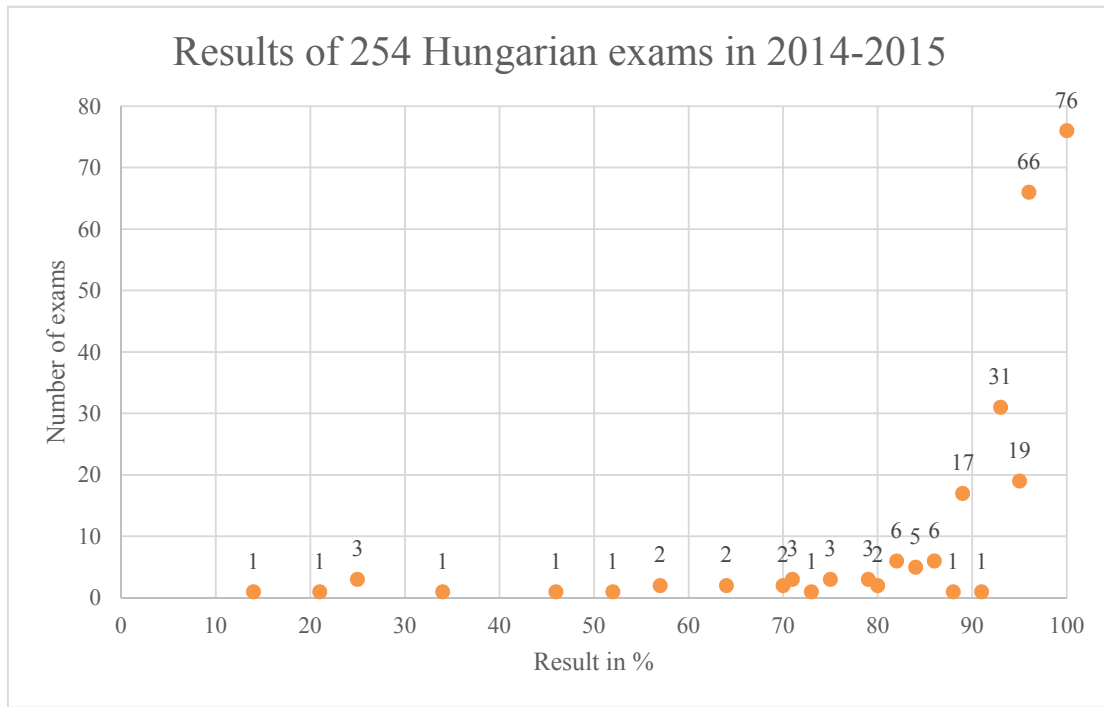
5. Results.

5.1 Excel results.

1. When do students feel the topic results are enough for the final exam? When do they stop practicing questions? For their least favourite topics do they stop studying at a lower score? (60% result threshold)

Algorithm: Result of the answers.





The average percentage students stopped studying a certain topic is from 52% -83%. There is a huge variation of percentages students got during their last time studying a topic.

For the English course, Semester 1 Animal Genetics, the lowest percentage average is for Parentage control at 58%. The highest percentage average is for meat and milk production at 75%. When we compare these results to the Survey results we get a clearer image of why there is such a large difference in percentage results. So the English students' least favourite topics are Genotype frequency calculations, Breeding Value Calculations and Calculation of inbreeding coefficient and genetic relationship. With percentage results of 61%, 64% and 68% consecutively. Students' favourite topics are Lifetime and age, AI and MOET and Individual markings. With results of 72%, 73% and 75%.

The same result is seen in the English course, Semester 2 Animal Breeding. According to Survey Monkey, students' most hated topics are Horse, Cattle and Teeth. Which received the lowest results, 67%, 70% and 75%. The students' favourite topics are Cat and Dog which got the highest average percentage of 82 and 83%.

The German Course shows similar results to the English course in both Semester 1 and Semester 2. The German students' least favourite Genetics topic is QTL analyses which have

one of the lowest results of 57%. The students' favourite topic of Individual markings gets the highest percentage of 75%. Likewise with Semester 2 Animal Breeding. The German course disliked poultry, their last time studying poultry averages at 54%. Their best topic is sheep with a score of 73%.

The Hungarian course however shows the opposite results. In Semester 1 Genetics students have ended their study on the lowest grade. Lifetime and age determination is the Hungarian students' favourite topics according to SM. Yet they only received an average score of 57%. Whereas in their worse topics. Biotechnology 1 and 2, they received 63% in both. In Semester 2 Animal Breeding both the students favourite and least favourite topics receive an average score of 75.

2. How many times do students attempt a topic before their exam?

We took an average of all students. In all 3 courses, English, German and Hungarians. In all 3 of the courses students take fewer attempts at the Semester 1, Genetics, and topics than Semester 2 Breeding topics.

The German students overall take fewer attempts at subjects, followed by the English course. The Hungarian course takes the most attempts practicing for their exam.

For Semester 1, Animal Genetics all 3 courses take the most attempts at Autosomal and X-linked topic. 63 attempts for the German course, 89 attempts for the English course and 111 attempts for the Hungarian course. VATEM also takes a high number (111) of attempts for the Hungarian students. Parentage control takes 104 attempts for the English students and 65 attempts for the German students. The highest overall.

Taking body measurements required the lowest amount of attempts for the English and German students. Milk and meat production was lowest for the Hungarian course.

In Semester 2, Animal Breeding, All 3 of the courses took more attempts. The poultry topics required the most tries. 102 attempts for the German students, 146 attempts for the English students and 201 attempts for the Hungarian students. The horse topics also took the English and the Hungarian students many attempts. 189 attempts for the Hungarian course and 157 attempts for the English course. The dog topic was high for the German course with 94 attempts.

3. How many students sat the exam without practicing GÁT before hand?

Algorithm: 303,304 without earlier results in topics.

	ENG	HUN	GER
1 sem	12	6	50
2 sem	66	35	31

Of the English Course more students sat the Breeding exam without study rather to the Genetics exam. The Hungarian course showed similar results. The German Course more students sat the Genetics exam without study rather than the Breeding exam.

The German students were the highest number to sit Animal Genetics without study. The English Students were the highest number to sit Animal Breeding without study.

4. When do students practice the GÁT System?

Algorithm: We collected the starting time of the different tests. AM= 5:00-17:00. PM= 17:00-5:00

Course	HUN	HUN	GER	GER	ENG	ENG
AM/PM	Pm	am	pm	Am	pm	Am
101	0,57	0,43	0,47	0,53	0,58	0,42
102	0,56	0,44	0,54	0,46	0,60	0,40
103	0,55	0,45	0,44	0,56	0,56	0,44
104	0,50	0,50	0,47	0,53	0,60	0,40
105	0,59	0,41	0,53	0,47	0,60	0,40
106	0,60	0,40	0,55	0,45	0,57	0,43
107	0,61	0,39	0,56	0,44	0,61	0,39
108	0,60	0,40	0,48	0,52	0,61	0,39
109	0,59	0,41	0,49	0,51	0,59	0,41
110	0,59	0,41	0,52	0,48	0,62	0,38

111	0,57	0,43	0,47	0,53	0,62	0,38
112	0,52	0,48			0,62	0,38
113	0,61	0,39	0,54	0,46	0,63	0,37
114	0,60	0,40	0,52	0,48	0,61	0,39
201	0,58	0,42	0,50	0,50	0,57	0,43
202	0,61	0,39			0,55	0,45
203	0,58	0,42	0,54	0,46	0,57	0,43
204	0,60	0,40	0,57	0,43	0,55	0,45
205	0,60	0,40	0,56	0,44	0,58	0,42
206	0,59	0,41	0,54	0,46	0,55	0,45
207	0,61	0,39			0,57	0,43
208	0,61	0,39	0,53	0,47	0,59	0,41
209	0,60	0,40	0,49	0,51	0,52	0,48
210	0,64	0,36	0,49	0,51	0,55	0,45
211	0,59	0,41			0,58	0,42

The above table shows the approximate time of students log in. AM means the student signed in between 5am and 5pm. PM means the student signed in between 5pm and 5am. The results across the board are similar for each topic and for each course. The Hungarian German and English course favoured the evening for studying the GÁT system. The German course has more students studying during the morning/day time than the other 2 courses.

5. How many days of preparation are necessary for the exam?

Algorithm: The earliest date of a test result before the exam day.

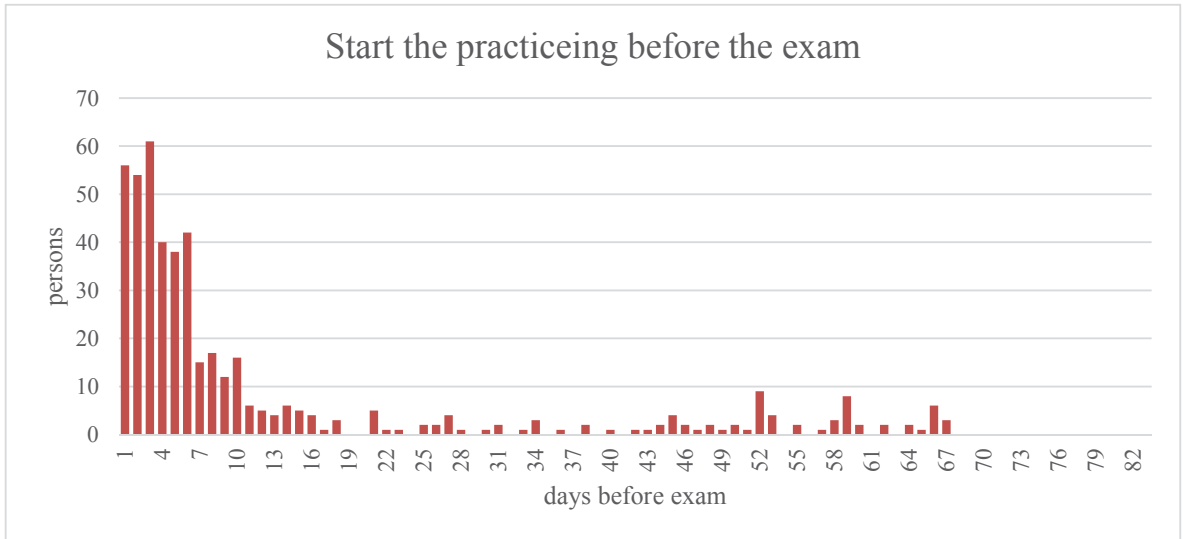


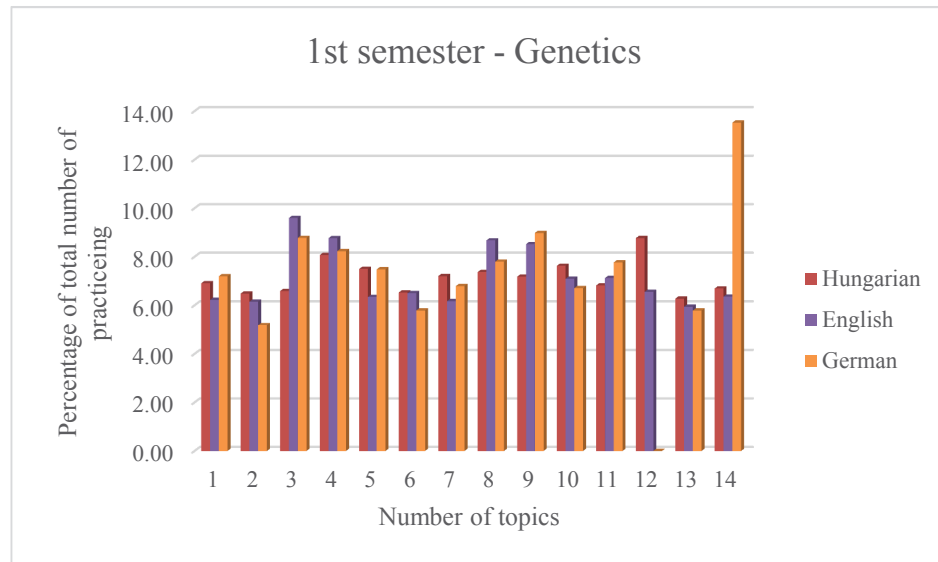
Figure 4 Number of days before exam to start preparation. (Total both semesters, all 3 years)

3 days before the exam is the most popular amount of time students spend practicing the GÁT system. With just over 60 people choosing this practice length. The majority of students start their practice from 1-10 days before the exam.

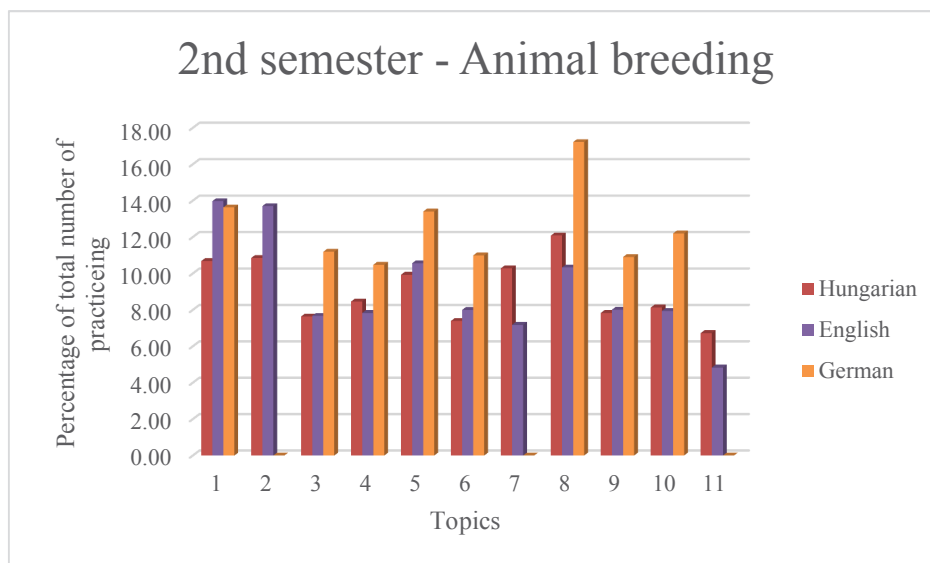
6. *How difficult/easy was a topic? How many repeat tests were taken of a topic?*

Algorithm: The number of the topic test was made as percentage of the total topic tests.

1. Semester.



2. Semester



5.2 Survey Monkey Results.

I analysed the results from the surveys sent out to the students. They are as follows;

English Course: The majority of students begin studying GÁT 1-3 days before the exam. At most up to one week before their exam. The worse topics of Semester 1 of the GÁT system, according to the English students are, Calculation of inbreeding coefficient and genetic relationship, Breeding Value Calculations and Genotype Frequency Calculations. From semester 2 the least favourite topics are Horse followed by Cattle and teeth. The favourite topics from semester 1 are AI and MOET, Lifetime and age determination, Individual markings. Dog and Cat are the favourite topics from semester 2. After receiving 100% in a topic most students practice that topic only a couple of times again, to ensure their knowledge. An overwhelming 60% of students see the GÁT system as a good study tool and 58% say it is a good examination tool. I asked the students their views on how to improve the GÁT system and their comments were to correct all the errors. More than one picture for each breed to ensure that students are learning the features specific for the breed rather than the background of the picture. The practice tests should integrate questions from a wide variety of topics instead of being topic specific. Allow the student to see the correct answers immediately instead of at the very end of the test. There were quite a lot of missing or duplicated pictures to be rectified. Some questions did not correspond with the correct answer. The majority of students are happy with the start time of the GÁT exam. One student did express concern over the long wait time between the GÁT part of the exam and the oral examination. 66% of students think that a similar programme to the GÁT system would be useful to other courses such as, Parasites practical, Nutrition feedstuff, and Surgery radiology, Anatomy, Histology and Botany.

German Course: Most of the German students begin studying the GÁT system 4-7 days before the exam. The worse topics for the German students from semester 1 were Autosomal and x-linked and the breeding value calculations. Semester 2 is Horse, Cattle and teeth. The favourite topics for the German course were Individual markings, parentage control, QLT analyse, From Semester 2 Sheep, Goat and wool. Most of the German course practiced the topics a couple of times after receiving top marks. The majority of students said that the GÁT

system is a good examination and study tool. They think that if they had the data to study throughout the year it would be a more beneficial tool. If they were to recommend a similar programme to other courses it would be, Anatomy and Biochemistry.

Hungarian Course: 50% of Hungarians practice 1-3 days before their exam. 33% 4-7 days before it. The least favourite topics for the Hungarian course are Biotechnology 1 and 2, and Molecular diagnostics from semester 1. From semester 2, Horse, cattle and poultry topics. Their favourite topics from semester 1 are Lifetime and age determination and body measurements. Their favourite topics from semester 2 are Dogs and tools for the majority of students. Like the English and German course most Hungarian students continue to practice the topics a couple more times after receiving 100% in that topic. Unlike the previous two courses the Hungarians only rate the GÁT system as an average study and examination tool. Improvements suggested were to have more of a cross over between the topics in the GÁT system and the oral examination. Replace all the faulty images. Use exhibition images with the same backgrounds. 81% of the Hungarian students would rather a later start time for the exam. This is also different from the English and German survey results. The Hungarian students recommend a similar programme for Clinical Diagnostics, Anatomy, Parasitology, Radiology, Pharmacology, Botany and Histology.

6. Discussions

6.1 Discussions on Excel Data.

Question 1:

From the English and German course results we can deduce students are receiving better results in the topics they rather or else they are spending more time improving the grade of their favourite topics. This follows a logical trend. Students get the better scores in the topics they like by practicing them most. Or on the other hand students rather the topics they are getting the best results on. Either way it's a logical pattern. Still the Hungarian results show the opposite findings but that can also be explained logically. The students are spending more time on the topics they like the least to gain a better understanding and therefore grade in that topic. They are finding the topics they like too easy or they already feel confident with those topics.

Question 2:

Among the 3 courses there are correlations between which topics take more and fewer attempts. This is good it indicates that the standard among the topics among the courses is similar. At the same time the variations in the amount of tries among the 3 courses is very interesting. The Hungarian course using way more attempts than the English and the German course. The German course taking way less attempts than the English course. Is the Hungarian GÁT exam more difficult? Do the Hungarians rather using GÁT as a study tool?

Question 3:

For the English course and the Hungarian course there is a drastic difference per semester of students not studying before their exam. A far greater number sat Semester 2 Animal breeding GÁT exam without studying compared to Semester 1 Animal Genetics. I think the reason for this is that Animal Genetics, Semester 1 is sat in the students' summer before 3rd year. Students do not have the luxury of carrying this exam. They must pass Animal Genetics in the 1st exam period of it or go inactive. Whereas Animal Breeding, Semester 2 is sat in the Winter Exam period of 3rd year. Students have the option of carrying this subject with plenty of options to sit it before the deadline of 5th year. With this in mind some students might take the risk of sitting the Animal Breeding exam in the first exam period of it, without study and hope to be successful.

Other options for the findings of the English and Hungarian course is that after sitting the GÁT exam for semester 1, Animal Genetics they felt it wasn't a difficult exam, and that they can "chance" the exam without study. Also the exam period that Animal Breeding is in, has a heavier load of subjects and exams. 6 exams compared to 5 exams. Perhaps students see Animal breeding as the one to drop as a study priority.

Strangely in the German course a lot of students decide to sit the exam without practice. And almost double do so in Semester 1 Animal Genetics. Are the German students' gamblers? More than half of the German students who study in Budapest apply to return to Germany to finish their degree for 3rd year onwards. I wonder if the high gambling rate among the Germans is simply due to the students who have found out they have a place in their home country to finish their veterinary degree.

Question 4:

More students are studying during the PM hours; there are only slight differences between the two. Approximately 40% - 60% is about constant for all topics. The German students seem to prefer the AM hour. Students study time is very subjective. I personally preferred to study for GÁT in the evening after I learned my notes for the oral.

Question 5:

Most students chose to spend 3 days practicing the GÁT system. The most popular lengths of time to practice were from 1-10 days. What we found most surprising from these results was the amount of students spending only one day of study before their exam. A handful of students started studying GÁT at an early stage. Up to 70 days before the exam. These students may have been checking out what the programme is about. Or they may have been using GÁT as a means of revision of the lectures and practices they attended. Or even to look over what is to come up in that weeks lecture and practical.

Question 6:

Semester 1, Animal Genetics the difficulty level of the topics seem to be uniform. All 3 courses repeated the exams a similar number of times. Except for topic 114, Milk and meat production where the German course repeated the topic almost double that of the English and Hungarian course.

For Semester 2, Animal Breeding, Overall the German course repeat the topics more than the other two courses. Topic 208 poultry is the most difficult for the German course. For the English course cattle and Horse topics are the most repeated. The Hungarian course all the topics are similar in regards to the amount of times repeated. We cannot solely put the amount of times a topic is repeated to the level of difficulty. Some students may repeat their favourite topics many times e.g. to end their study on a high note.

6.2 Discussion on Survey Monkey results.

The SM results help to give us a precise guide to how the students would like to see the GÁT system improved. All 3 courses commented on the mistakes in the system. Missing and duplicated pictures incorrect questions corresponding with incorrect answers. Some of the improvements the students asked for we had discussed ourselves. Like having more than one picture per breed or using exhibition photos with uniform backgrounds. Other comments such as interrogating a wide variety of topics in the practice test instead of being topic specific. Having the data throughout the year or the long wait time between the GÁT exam and the oral exam provided food for thought. I wonder would it be beneficial having the GÁT part of the Animal Breeding and Genetics exam on a different day to the oral e.g. during the last practical class. This might encourage students to study genetics and breeding throughout the semester. It would also increase students desire to sit the exam earlier on in the exam period.

We were delighted to see the English and German course describing the GÁT system as both a good study and examination tool. The fact that they would recommend a similar programme for many other subjects is very promising. Although the Hungarian course only graded the GÁT system as an average study and examination tool is sad to hear. Hopefully taking on the above criticism and some improvements to the programme in a future survey all 3 of the courses will be more impressed.

7. Summary

This thesis is focused on the GÁT system of the Genetics and Breeding department. The GÁT system is a computer based multiple choice exam used to test the students practical knowledge. Students are graded from 1-5. After students pass this part of the exam they can go ahead and sit the oral section of the exam. The GÁT system is also a study tool for the students. They are able to log on at home, strictly anonymous using their Neptune code and date of birth as password. Students can practice the topics that will be examined in their final exam.

We researched multiple papers that researched both computer based examinations and multiple choice exams. All the literature indicated that computer multiple choice exams are a very efficient ways to examine students' knowledge. It is a natural progression. Moving with the times we now live in. These exams decrease the work load on the examiner. There is no paper or correcting. Computer exams decrease the chance of students cheating; therefore it makes it a fairer exam. Multiple choice question exams are a good means of testing the students' basic knowledge. Unfortunately it is not ideal for testing the students' deeper knowledge. Students are used to doing everything on their computer now it's no surprise that they are comfortable and respond well to computer based exams. There have been hundreds of studies carried out on the pros and cons to having a computer based examination. The results show that the positives far outweigh the negatives. Not only are computer based examinations like the GÁT system beneficial to the examiners. They also prove to be a good basis for study and testing of students. The GÁT system and other such computer exams decrease the work load on the examiner. They do not have to make individual exams for each test sitting. Once there is a large database of questions inputted to the computer, the examiners work is pretty much finished. The computer will create a unique exam for each student. Randomly selecting from the data base of questions. There is need for anyone to correct the exam. It is automatically done by the computer. There is no wait for a result. No hassle of paper. No waste and there is less chance of human error in correction of the exam.

Students instantly see their results and where they erred. We live in an era where everything is being changed to be done using technology. Students nowadays are more comfortable working

with computers than they are with pen and paper. The GÁT system meets all the requirements of being an excellent examination method. By allowing students to practice on the GÁT programme before the exam, it gives the students every opportunity to have a successful examination. There are no surprises. By using pictures for animal breeding students have a visual example of each breed. It is easier to learn what the common breed traits are when you can visualise them as opposed to a description.

We gathered information about the GÁT system via the students log in. The programme records the times the student logs in, the topics they practice and the results they get. This data was inputted to an excel data sheet and analysed. From this data we deduced that most students spend under 10 days practising GÁT before their exams. More students from the Hungarian and English courses sat their breeding exam without any practice before hand. More of the German course sat their Genetics exam without study. The German course practiced the topics the most times after that the English course and the Hungarian course practiced the topics the least amount of times. Students in general rather studying GÁT in the evening time. Students received a grade between 60-80% on their last attempt of the topic before the exam.

We sent out a survey to all the students who sat the GÁT exam. Using the website Survey Monkey and distributing it to the students via email. Both the English and the German course found the GÁT system a good study and examination tool. The Hungarian course only rated it as an average study and examination course. Students said they would like to see a similar programme in other subjects. Anatomy, Botany, Radiology, Parasitology and Nutrition feedstuffs were their subject suggestions. Students favourite Genetics topics are individual markings, parentage control and lifetime and age determination. Their least favourite topics are Breeding value calculations and autosomal and x linked. Students' favourite Breeding topics are dog and cat. Their least favourite topics are poultry and cattle. Students were also able to give us there comments on the GÁT system. Most were positive but would like a couple of improvements to be made. Such as faulty questions fixed, more pictures per breed to decrease the chances of students learning the backgrounds of the pictures and more variety in the questions to test more topics.

While researching this thesis, I found that in both my own experiences of the GÁT system and in our finding of other students' opinions similar thoughts on how to improve the GÁT system. First of all there are some mistakes on the GÁT programme that will be a priority to be fixed. Some questions and answers are incorrect. The phrasing of some questions needs to be changed. The questions should be clear and concise. Students should be able to have a quick understanding of what exactly the question is asking.

By increasing the amount of question options in the GÁT system will allow the Animal Breeding and Genetics department to examine students more thoroughly on their knowledge of their curriculum. By increasing the amount of questions on each breeding and genetics topic, it will increase the students' potential to learn and get a better understanding of each topic. Having more question options means students will have to gain a deeper understanding of the subject. With only a small set of questions students can get an adequate result in their exam by superficially learning the set of questions and answers.

By having a large collection of pictures, GÁT can test the students with random pictures. Instead of having one picture, correct for each question, there is a set of 3 – 4 correct pictures for each question. This means that even if the student remembers the question from their study at home they will need to have a good understanding to pick out the correct answer. It is a good way to eradicate students memorising the unimportant information in the picture i.e. looking at the background of the photo instead of the actual animal. It forces students to pay attention to the specific breed traits. Like the folded over ears of the Scottish fold cat. Another option is to have a different set of practice pictures to test pictures. Both sets would have the exact same breeds but the exact picture would be different. Ideally if you could have a test set with a uniform background.

The majority of students receive very good grades in the GÁT exam. This is a good sign. Students seem to be successful in the exam after only a few days study. On the other hand perhaps the GÁT exam is too easy. We have no information as to whether students are retaining the information long term. With the set of question in the GÁT system students are tested on a very narrow spectrum of the curriculum. With more questions we can gain a broader sense of the students' knowledge and level of understanding in Breeding and Genetics.

The overall results from the surveys, discussions with students and excel data are very positive for the GÁT system. We strongly believe that with some small modifications the GÁT programme and exam will truly be a great addition to the Animal Breeding Department. It will be a model programme to be copied by other departments. I asked the students in the survey, what subjects they think will benefit from a similar programme. Most students are thinking on the same page. Nutrition department, for their feedstuffs or parasitology department, for the practical section of the course. Even if the departments don't want to use this programme as part of their examination programme it would be a good tool to install to assist students in their study for this subject.

8. Conclusion.

In conclusion the GÁT system has proven to be a very useful study and examination tool. There are a couple of adjustments to be made to make it the best programme possible.

1. Correct any mistakes in the programme. Some questions do not correspond to the correct answer. Some photos are duplicated or missing.
2. Add multiple pictures of each breed or use exhibition photos so students are forced to learn the specific traits of an animal instead of the background photo.
3. Add more questions per topic. Examine the student more in depth.
4. Add more topics to the GÁT system. Allow students to gain a more overall knowledge of Animal Genetics and Animal Breeding.

Once these tasks have been carried out the GÁT system should really benefit both the students and the lecturers in the Animal Breeding and Genetics Department.

9. References

Anne-Marie Brady, 2004, Assessment of learning with multiple-choice questions.

Mercedes Douglas, Juliette Wilson, Sean Ennis, 2012, Multiple choice question tests: a convenient, flexible and effective learning tool? A case study.

Martin Ebner and Andreas Holzinger, 2007 Successful implementation of user-centred game based learning in higher education: An example from civil engineering.

William L Kuechler, Mark G Simkin, 2005 How well does multiple choice tests evaluate student understanding in Computer Programming classes?

Jeri L Little, Elizabeth Lignan Bjork, 2015, Optimizing multiple choice tests as a tools for learning.

Anthony M. Marks Nelson, Johannes C. Cronje, 2008 Randomised Items in Computer-based Tests: Russian roulette in Assessment?

Marina Papastergiou, 2009 The retention time of computer based learning methods Digital Game-Based Learning in high school Computer Science education: Impact on educational effectiveness and student motivation.

Jayne Pawasauskas, Kelly L Matson, Rouba Youssef, 2014, Transitioning to computer-based testing.

Katrien Struyven, Filip Dochy, Steven Janssens, Wouter Schelfhout, and Sarah Gielen, 2006 The Overall Effects Of End-of-Course Assessment on Student Performance: A Comparison Between Multiple Choice Testing, Peer Assessment, Case-based Assessment and Portfolio Assessment.

Yogeeta Walke, Amey Skamat, Sushama A Bhounsule, 2014, A retrospective comparative study of multiple choice questions as assessment tool in evaluating the performance of the students in medical pharmacology.

Adeel Yang, Hersh Goel, Mathew Bryan, Ron Robertson, Jane Linn, Shehran Islam, Mark Speider, 2014, The Picmonic learning system enhancing memory retention of medical sciences, using an audiovisual mnemonic web based learning platform.

10. Acknowledgements

Dr. Ákos Mároti-Agóts.

Balázs Pallos.