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Report on the outcomes of the testing of the Agri-Learn E-Platform



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1. Introduction

The Agri-pedia team administered a survey to the 2016 ANIG2164 class of the University of the Free State (UFS) to measure their experience with the Agri-Learn platform. The Agri-pedia team gained the assistance of Dr Lizette De Wet from the Department of Computer Science and Informatics at the UFS to ensure that this process was scientifically sound. Dr Lizette designed a questionnaire consisting of 15 questions (Appendix A).

The questionnaire were divided into 4 sections:

- A. Demographic Information – Basic student information, to help group the data;
- B. General use – The students' use of the Agri-Learn platform;
- C. Text Book – Their experience with their prescribed text book;
- D. Electronic Platform – The students' sentiment toward electronic platforms.

The questionnaire was initially given to the students in printed format after a semester test, and they all filled it in by hand. As the marks of the first semester test was not up to standard, an online test was given to the students to answer after being giving a chance to prepare for it using Agri-Learn. Lastly students were given a second questionnaire based on their examination preparation in order to determine whether Agri-Learn has added value in terms of their preparation, knowledge gained and marks obtained.

Following the introduction, the digitalization process of the questions based on semester test 1 is discussed. This is followed by the analysis of the semester test data, and its representation. The report then continues by discussing the results of the questionnaire that was administered after the written examination, its analysis and discussion. The report then ends with concluding remarks.

2. Semester Tests

2.1 Question Digitalisation

This questionnaire consisted of 2 types of questions, namely nominal (categorical) and ordinal (ranked). Questions 2 -5, 8, and 18 were all nominal, while questions 6, 7, 9 – 15 were ordinal.

2.1.1 Nominal Questions

Question 2 (gender) was codified into M for male and F for female and later re-codified into 1 for male and 0 for female.

Question 3 (language of class attending) was codified into A for Afrikaans and E for English, and later re-codified into 1 for Afrikaans and 0 for English

Question 4 (I am aware of the existence of the Agri-Learn platform) was codified into Y for Yes and N for No. An ignored question was considered a No. Later it was re-codified as 1 for yes and 0 for no.

The multi option questions 5 and 8 (Q5: reasons for not using the Agri-Learn platform; Q8: circumstances under which it will be used more frequently) was codified as a Y for yes. If nothing was marked, it was considered as a no.

Questions 5.1 – 5.7, 8a – 8i and Section E were frequency counts and codified by dividing the number of people in the group that ticked that option by the number of students in the group and presented as a percentage.

The nominal questions (frequency counting questions) were analysed by adding the total number of occurrences of a yes, and dividing that sum by the total number of respondents. The result was a percentage of occurrence.

2.1.2 Ordinal Questions

All the ordinal questions in this questionnaire were based on a Likert scale, therefore they were simply codified from 1 to 5 or from 1 to 7, depending on the number of options. Questions 6, 7, 10 -15 were codified from 1 -5 and question 9 was codified from 1 – 7.

The student responses were summed per questions and divided by the total number of respondents. This resulted in an average between 1 and 5 or 1 and 7. This average gave the general sentiment of the students per language group. This average number was then divided by 5 or 7, depending on the upper scale value for that question. A value between 0 and 1 for each question was the result which represented the sentiment of the group. The higher the number the higher the sentiment, and vice versa.

A short note on the treatment of ordinal data. The avid reader will note that the ordinal data was treaded as interval data. The reason for this was that the assumption that the intervals created by options were equally spaced and that they would be interpreted that way. The problem that lead to this assumption was that the weight of each interval was unknown. This could have been adjusted by the additional sentiment of the respondents by looking at remarks given. Even if there were respondents who wanted to express themselves more strongly, it was suppressed in a way as not to skew the statistical results unnecessary. Therefore, for the benefit of this report equal intervals were assumed that resulted in a positive or negative sentiment. The main idea was to find the general trend or sentiment.

2.2 Semester Tests Analysis

2.2.1 Overall Questionnaire Score Percentages

In order to obtain an overall idea of the responses to the questionnaires, the percentages are given in Table 1 below.

Table 1: Comparison of all the questions with their scores

Question Number	Question	Type of Question	Score or Frequency	Read as:	Percentage
Q2	Gender (Male)	Frequency	74.00	Male	66.07%
Q3	Language of class (English)	Frequency	53.00	English	47.32%
Q4	Used platform	Frequency	27.00	% of people marked	24.11%
Q5.1	No need	Frequency	41.00	% of people marked	36.61%
Q5.2	No time	Frequency	42.00	% of people marked	37.50%
Q5.3	Would not use anyway	Frequency	18.00	% of people marked	16.07%
Q5.4	Not part of curriculum	Frequency	15.00	% of people marked	13.39%
Q5.5	Marks negligible	Frequency	10.00	% of people marked	8.93%
Q5.6	Lecturer does not use system	Frequency	14.00	% of people marked	12.50%
Q5.7	Other (comment)	Frequency	27.00	% of people giving a comment	24.11%
Q 6	Necessity	Ave (out of 5)	3.60	General impression	72.00%

Table 1 Continued.

Q7	Frequency of use	Ave (out of 5)	3.00	General impression	60.00%
8.a	Part of curriculum	Frequency	35.00	Percentage of people marked	31.25%
8b	Contributed to semester mark	Frequency	28.00	Percentage of people marked	25.00%
8c	Used in class	Frequency	20.00	Percentage of people marked	17.86%
8d	Replaced text book	Frequency	19.00	Percentage of people marked	16.96%
8e	Use in practicals	Frequency	13.00	Percentage of people marked	11.61%
8f	More practical sessions	Frequency	16.00	Percentage of people marked	14.29%
8g	Use in extra classes	Frequency	11.00	Percentage of people marked	9.82%
8h	Used by more modules	Frequency	12.00	Percentage of people marked	10.71%
8i	Other (comment)	Frequency	11.00	Percentage of people giving a comment	9.82%
Q9.1	Text book inadequate / adequate	Ave (out of 7)	5.54	General impression	79.12%
Q9.2	Text book frustrating / enjoyable	Ave (out of 7)	3.50	General impression	50.00%
Q9.3	Text book dull / exciting	Ave (out of 7)	4.43	General impression	63.27%
Q9.4	Text book difficult / easy to read	Ave (out of 7)	4.11	General impression	58.73%
Q9.5	Text book difficult / easy to follow	Ave (out of 7)	4.11	General impression	58.73%
Q10	Electronic assignments	Ave (out of 5)	3.90	General impression	78.00%
Q11	Prefer electronic to written tests	Ave (out of 5)	3.63	General impression	72.63%
Q12	More exciting than TB	Ave (out of 5)	3.50	General impression	70.00%
Q13	Encourage fellow students	Ave (out of 5)	3.70	General impression	74.00%
Q14	Better after 1 st online test	Ave (out of 5)	3.75	General impression	75.00%
Q15	Use in exam preparation	Ave (out of 5)	3.58	General impression	71.58%
Section D	General comments	Frequency	6.00	Percentage of people giving a comment	22.22%

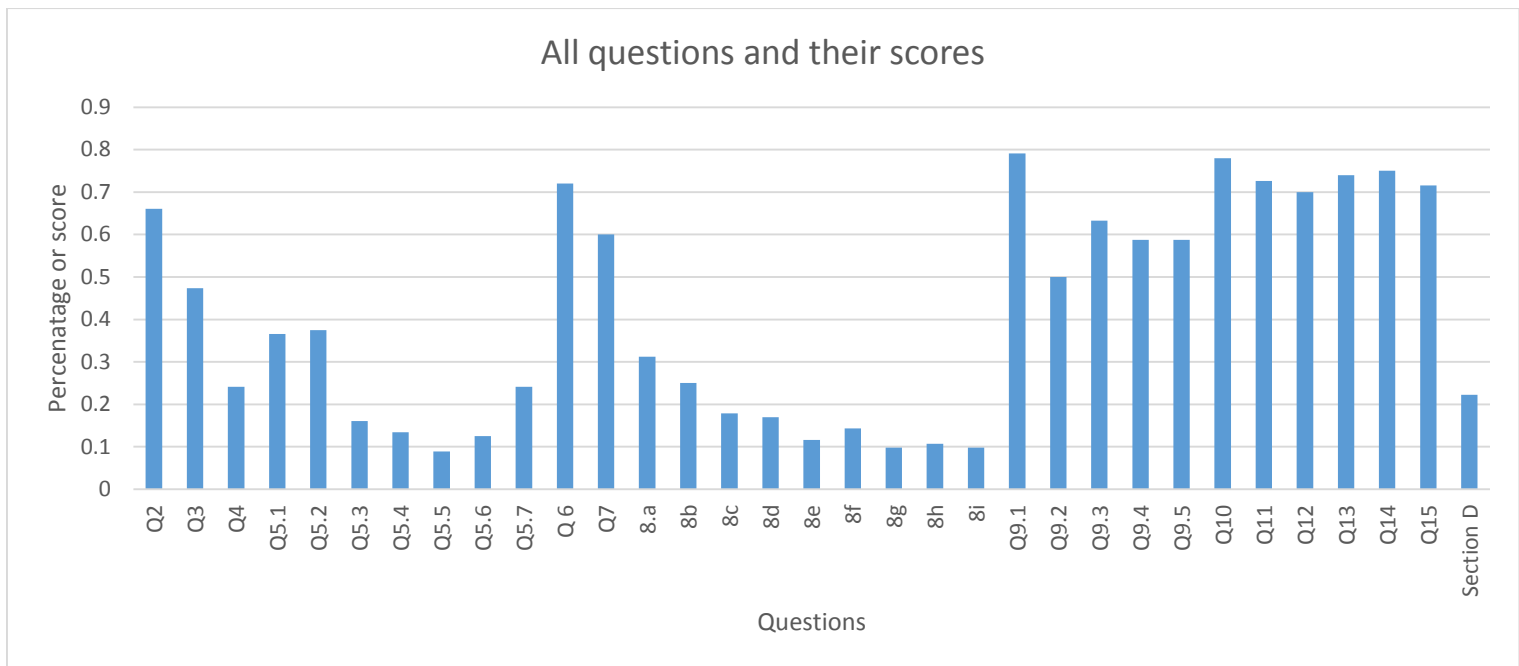


Figure 1: Comparison of all the questions and their scores

From Figure 1 and Table 1 it can be seen that about 24% of the students have made use of the Agri-learn platform (Question 4) to prepare for their semester tests. The highest rated reason for not using the Agri-Learn platform was that the students did not have enough time (Question 5.2: 42%). The second most prominent answer was that they did not see the need for it (Question 5.1: 41%).

Seventy two percent of the students, however, indicated that Agri-Learn was necessary for the module. The highest rated reason for this positive reaction was that students claimed that they would use Agri-Learn if it formed part of their curriculum (Question 8.a: 35%). The second best response in terms of when the platform would be used more frequently was related to its contribution towards the overall semester mark (Question 8.b: 28%). Responses to Question 9 indicated a general positive attitude toward the current prescribed text book. Similarly Questions 10 – 15 showed a general positive attitude towards electronic learning in general, such as doing assignments on the platform (Question 10: 78%), writing online tests (Question 11: 73%), and even encouraging other students to use the system (Question 13: 78%).

2.2.2 Using Agri-Learn in Preparation for Semester Test 1

In order to determine whether there was a trend between question 4 (I have made use of the Agri-Learn platform in preparing for semester test 1) and the rest of the questions, the data was presented in Table 2 and Figure 2 below.

From the results it is clear that more of the students attending the Afrikaans classes did not use the Agri-Learn platform compared to their English counterparts (46% compared to 30%). It is also clear that students who did not use the platform gave more reasons for not using it. It seems like a bit of a contradiction that students indicating that they did not use the platform still indicated via Question 7 (how many times the platform was used during the semester) that they have occasionally used Agri-Learn.

It should be noted that students who did not use the system had a slight negative sentiment toward the system with a sentiment of 48.8% for questions 6 (was the platform necessary) versus a positive sentiment of 67.4% for students that did use it to prepare for their semester test, as can be seen from Table 2 below.

The responses to Questions 8 (a) to (i), which dealt with the conditions under which the students would use the Agri-Learn platform more often, showed that students who indicated that they have not made use of the platform to prepare for semester test 1 (answered *no* to question 4), had an overall higher need for incentives compared to those who used the system. This can be seen from Table 2 below where 17.9% students who did not use Agri-Learn to prepare for their semester test indicated that if Agri-Learn contributed to their semester mark they would use it more, as opposed to 7.1% for students who did use Agri-Learn to prepare for their semester test. Also 15.2% of students who indicated that they did not use Agri-Learn to prepare for their semester test indicated that they would use it more if it was used in class, as opposed to 2.7% of students who did use Agri-Learn to prepare for their semester test.

Table 2: Trends between Students' Use of Agri-Learn (Question 4) and Other Question Responses

Question Numbers	Questions	% Not using Agri-Learn (No)	% Using Agri-Learn (Yes)
Q3 Eng	Attend English classes	29.5%	17.9%
Q3 Afr	Attend Afrikaans classes	46.4%	6.3%
5.	REASONS FOR NOT USING /REGISTERING ON THE PLATFORM:		
5.1	No need	36.6%	0.0%
5.2	No time	37.5%	0.0%
5.3	Would not use anyway	16.1%	0.0%
5.4	Not part of curriculum	13.4%	0.0%
5.5	Marks negligible	8.9%	0.0%
5.6	Lecturer does not use system	12.5%	0.0%
5.7	Other / comment	24.1%	0.0%
6	Necessity	48.8%	67.4%
7	Frequency of using the system so far	37.1%	57.0%
8.	WILL USE THE PLATFORM MORE FREQUENTLY IF:		
8.a	Part of curriculum	23.2%	8.0%
8.b	Contributed to semester mark	17.9%	7.1%
8.c	Used in class	15.2%	2.7%
8.d	Replaced text book	13.4%	3.6%
8.e	Use in practical sessions	7.1%	4.5%
8.f	More practical sessions	8.0%	6.3%
8.g	Use in extra classes	7.1%	2.7%
8.h	Used by more modules	4.5%	6.3%
8.i	Other / comment	8.0%	1.8%

Table 2 Continued.

9. PRESCRIBED TEXT BOOK:			
9.1	Inadequate / adequate	74.6%	75.2%
9.2	Frustrating / enjoyable	66.9%	55.6%
9.3	Dull / exciting	70.0%	65.9%
9.4	Difficult / easy to read	66.1%	58.1%
9.5	Difficult / easy to follow	67.8%	58.1%
10	Prefer electronic assignments	54.8%	75.6%
11	Prefer electronic to written tests	53.9%	65.4%
12	More exciting than text book	46.0%	65.2%
13	Encourage fellow students	49.2%	70.4%
14	Better after 1 st online test	49.9%	71.1%
15	Use in exam preparation	48.0%	70.0%
Section D	General comments	27.7%	7.1%

Question scores based on the Answer of question 4 (I have made use of the Agri-Learn platform)

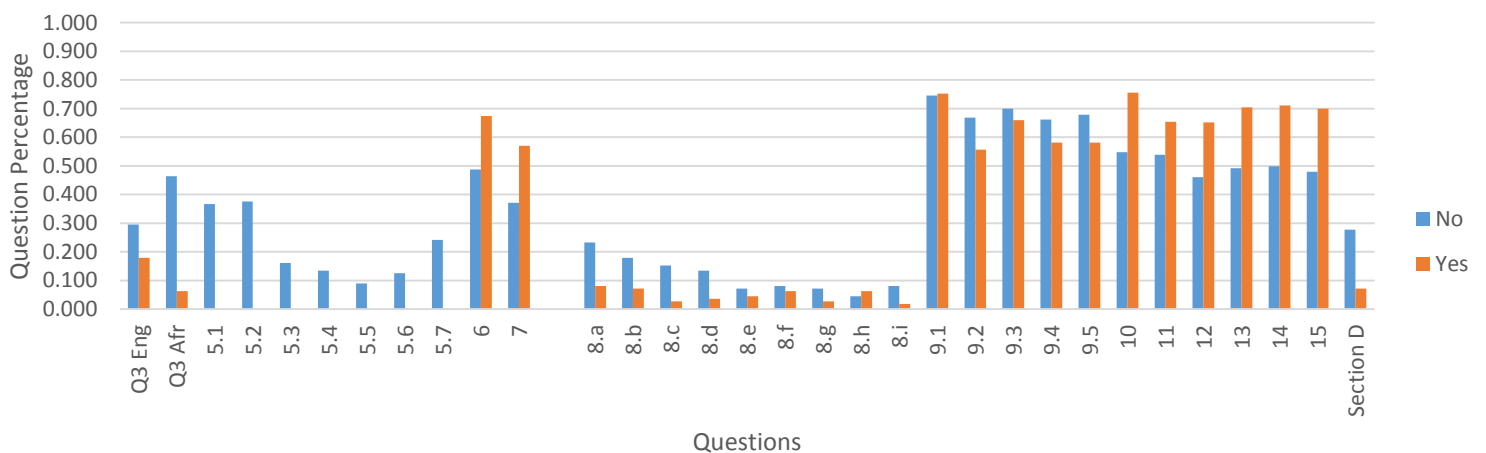


Figure 2: Trends between Students' Use of Agri-Learn (Question 4) and Other Question Responses

For Questions 9.1 to 9.5, which deal with the currently prescribed text book, students indicated that those who used the Agri-Learn platform to prepare for their first semester test were a bit more critical towards the current text book than those students who did not. This can be seen from the slightly higher sentiment toward the text book from students that answered that they have not used Agri-Learn to prepare for the semester test. Question 9.2 shows that students that did not use Agri-Learn had a 66.9% positive sentiment that the text book was enjoyable, while students that used Agri-Learn had a 55.6% positive sentiment. This same trend can be seen in the other questions related to the text book (Q9), the exception being question 9.1, where both groups had a 75% (rounded) positive sentiment towards the adequacy of the text book. It should be noted, however, that all students gave positive feedback on the text book, as is quite evident from Figures 1 and 2.

From questions 10 – 15, which prompted the students for their opinions about electronic learning, it can be seen (refer to Figure 1) that students who used Agri-Learn to prepare for their semester test had an overall positive attitude toward electronic learning, whereas students who did not use Agri-Learn had a neutral to slightly negative sentiment toward electronic learning.

Comments received for Section D, which was just a general comment section, indicated that students who did not use Agri-Learn (answered no to question 4) were more willing to express their opinions compared to those students who used Agri-Learn. These comments were, in general, negative, and thus added to the negative sentiment of those students.

In order to understand the results given to question 7 (frequency of use), the original questionnaire should be looked at in conjunction with the codification process. For students who did not use the Agri-Learn platform, the value was 37.1%. This is a value between the *never* option and the *once* option. This means that a small number of the students who did not use Agri-Learn to prepare for their semester tests, never used Agri-Learn, but most of them used it at least once. The percentage of students who used Agri-Learn to prepare for their semester test was 57%, and this corresponded to a value between *once* and *2-5 times*. This means that these students used Agri-Learn more than once, and most likely between 2-5 times on average.

In order to determine if there was a significant difference between the results of the answers given by the students attending the Afrikaans classes (Question 4) versus those of the students attending the English classes, data will be presented for this scenario in the next subsection

2.2.3 Afrikaans versus English Results

Table 3 shows the comparison between the data of students attending the Afrikaans classes to students attending the English classes, based on questions 4 (I have made use of the Agri-Learn platform to prepare for my semester test):

Table 3: Comparison by Class Attendance Language (Question 3) and the Use of Agri-Learn (Question 4)

Question Number	Question	Used Agri-Learn		Did not use Agri-Learn	
		English	Afrikaans	English	Afrikaans
Q5.1	No need	0.0%	0.0%	20.6%	66.7%
Q5.2	No time	0.0%	0.0%	29.4%	62.7%
Q5.3	Would not use anyway	0.0%	0.0%	5.9%	31.4%
Q5.4	Not part of curriculum	0.0%	0.0%	8.8%	23.5%
Q5.5	Marks negligible	0.0%	0.0%	2.9%	17.6%
Q5.6	Lecturer does not use system	0.0%	0.0%	11.8%	19.6%
Q5.7	Other / comment	0.0%	0.0%	35.3%	29.4%
Q 6	Necessity	72.0%	54.3%	60.6%	41.5%
Q7	Frequency of use	60.0%	48.6%	43.5%	31.9%
8.a	Part of curriculum	25.0%	57.1%	35.3%	27.5%
8b	Contributed to semester mark	40.0%	0.0%	23.5%	23.5%
8c	Used in class	5.0%	28.6%	14.7%	23.5%
8d	Replaced text book	15.0%	14.3%	11.8%	21.6%
8e	Use in practical sessions	20.0%	14.3%	11.8%	7.8%
8f	More practical sessions	30.0%	14.3%	14.7%	7.8%
8g	Use in extra classes	15.0%	0.0%	11.8%	7.8%
8h	Used by more modules	20.0%	42.9%	5.9%	5.9%
8i	Other / comment	5.0%	14.3%	8.8%	11.8%
Q9.1	Text book inadequate / adequate	79.1%	66.7%	81.0%	77.1%
Q9.2	Text book frustrating / enjoyable	50.0%	65.3%	68.7%	68.0%
Q9.3	Text book dull / exciting	63.3%	69.0%	72.4%	69.2%
Q9.4	Text book difficult / easy to read	58.7%	57.1%	69.8%	67.7%
Q9.5	Text book difficult / easy to follow	58.7%	57.1%	71.4%	69.3%
Q10	Electronic assignments	78.0%	49.0%	45.8%	35.7%
Q11	Prefer electronic to written tests	72.6%	32.7%	46.2%	34.2%
Q12	More exciting than TB	70.0%	36.7%	37.5%	30.2%
Q13	Encourage fellow students	74.0%	42.9%	42.9%	29.9%
Q14	Better after 1 st online test	75.0%	42.9%	42.0%	31.3%
Q15	Use in exam preparation	71.6%	46.9%	42.9%	29.3%
Section D	General comments	30.0%	28.6%	38.2%	35.3%

Graph of questions grouped by class attendance and Question 4 (I have used Agri-Learn to prepare for the semester test)

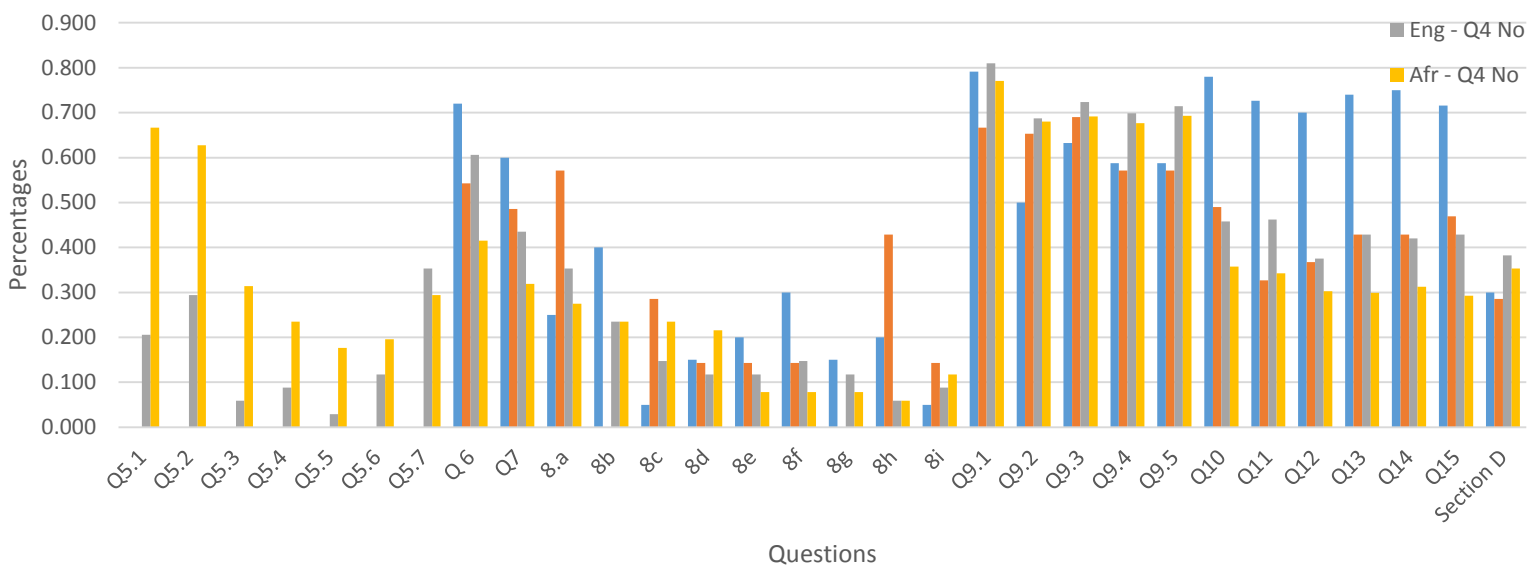


Figure 3: Comparison by Class Attendance Language (Question 3) and the Use of Agri-Learn (Question 4)

The questionnaire was designed in such a way that when respondents indicated that they used Agri-Learn (Yes to question 4), they did not need to answer the rest of question 5 (5.1 to 5.7). This is reflected in Table 3.

For the remainder of this report and for the sake of convenience, the students who indicated that they attended classes presented in Afrikaans, will be referred to as 'Afrikaans students', while students who indicated that they attended the classes presented in English, will be referred to as "English students.

From Table 3 it is evident that Afrikaans students considered the Agri-learn platform as unnecessary and that they did not seem to have time to use it (Q 5.1, and 5.2). Overall Afrikaans students had more complaints than the English students (Q 5.1 – 5.7).

English students mainly felt that Agri-learn was necessary, with a 72% positive sentiment (Q6). They were also more likely to use the platform than their Afrikaans counterparts, as can be seen in responses from Question 7 (60% versus 49%, where a higher value meant more responses for higher frequency uses), although the difference was not much. As could be expected, students who answered yes to question 4 (have used Agri-Learn: 60% + 49%) have used the system more frequently according to their response to Question 7 than students who answered no to question 4 (44% + 32%).

Afrikaans students were the most likely to use Agri-Learn if it formed part of their curriculum (Q8.a: 57%) Forty three percent of Afrikaans students indicated that they would use the Agri-learn platform if it was used in more modules in the Faculty (Q8.h) compared to 20% of the English students.

From Questions 9.4 and 9.5 it can be seen that students who used Agri-Learn considered the text book more difficult to read and difficult to follow compared to students who did not use Agri-Learn (58.7% and 57.1% compared to 69.8% and 67.7% respectively (these were results for question 9.4, but question 9.5 had a similar trend). English students who used Agri-Learn found the text book most frustrating with an enjoyable factor of 50.0%, while other groups averaged around 67%.

From Questions 10 – 15 which dealt with electronic learning, English students who used Agri-Learn (answered yes to question 4) had a more positive attitude toward electronic learning compared to their Afrikaans counterparts.

From the general comments count, it can be seen that students who used Agri-Learn had the most comments. English students, overall, gave more comments than Afrikaans students.

2.2.4 Correlation and Chi Square Tests

From the discussion in the previous section, a correlation between Question 3 (language of class attendance) and some of the questions could be expected, as well as between Question 4 (use of the online platform for semester test preparation) and all the ordinal questions, because of the numeric codification of these questions. Thus a correlation test was performed.

It is known that a correlation factor of $>|0.3|$ gives confidence that a relationship exists.

Table 4: Correlation between Language of Class Attendance (Questions 3), Use of Agri-Learn (Question 4) and the Rest of the Questions

Question Number	Q 6	Q7	Q9.1	Q9.2	Q9.3	Q9.4	Q9.5	Q10	Q11	Q12	Q13	Q14	Q15
Question	Necessity	Frequency of use	Text book inadequate / adequate	Text book frustrating / enjoyable	Text book dull / exciting	Text book difficult / easy to read	Text book difficult / easy to follow	Electronic assignments	Prefer electronic to written tests	More exciting than TB	Encourage fellow students	Better after 1 st online test	Use in exam preparation
Correlation with Q 3 (Class Language)	0.503	0.373	0.138	-0.105	-0.033	0.022	0.012	0.397	0.446	0.393	0.481	0.434	0.465
Correlation with Q 4 (Use of Agri-Learn)	0.350	0.425	0.009	-0.172	-0.066	-0.120	-0.131	0.385	0.208	0.393	0.404	0.423	0.392

From Table 4 and based on the correlation factor explained above, it can be seen that a strong correlation exists between Question 3 and Questions 6, 7, 10, 11, 12, 13, 14, and 15. Question 4 has strong correlation with questions 6, 7, 10, 12, 13, 14, and 15. Question 9 seems to be removed from these relationships, but this is understandable since it deals with the text book and not with the Agri-learn platform.

To prove that the correlation is real and not an anomaly, a chi-square test was performed on some of the variables. We chose the question with the highest correlation with Question 3 (language) to start off with, and that seemed to be Question 6 (necessity of Agri-Learn). However, a connection with the questions relating to the electronic platform were more relevant, since that would establish a relationship between all the other similar questions. The second highest score was for Question 13, and this was more meaningful because it could be used to establish a relationship between class language and electronic platform learning, specifically whether the respondents would encourage fellow-students to use Agri-Learn.

Table 5: Chi-Square Analysis of Class Language (Question 3) with Encouraging fellow-students (Question 13)

TRUE	Class Language (Q3)		Encourage fellow-students (Q13)
	ENGLISH	AFRIKAANS	TOTAL
1	3	20	23
2	4	13	17
3	25	21	46
4	17	4	21
5	4	1	5
Tot	53	59	112
Expected	English	Afrikaans	Total
1	11.5	11.5	23
2	8.5	8.5	17
3	23	23	46
4	10.5	10.5	21
5	2.5	2.5	5
$\chi^2(4, N = 112) =$	1.56E-05		
$\rho <$	0.0112		

Table 5 shows that question 3 (class language) has a high confidence positive relationship with question 13 (I would encourage other students Agri-learn is necessary) with $\rho < 0.05$.

To test the relationship of Question 4 (use Agri-Learn or not), it was decided to use Question 7 (frequency of using Agri-Learn), since Question 7 had the highest correlation with Question 4.

Table 6: Chi-Square Analysis of Use of Agri-learn (Question 4) and Frequency of using Agri-Learn (Question 7)

	Q4		with	Q7
TRUE	Yes	No		Total
1	3	34		37
2	5	32		37
3	14	15		29
4	3	2		5
5	2	1		3
Tot	27	84		111
Expected	Yes	No		Total
1	18.5	18.5		37
2	18.5	18.5		37
3	14.5	14.5		29
4	2.5	2.5		5
5	1.5	1.5		3
$\chi^2(4, N = 111) =$	2.19E-09			
$\rho <$	0.0001			

The results in Table 6 indicate that there is a very strong relationship between the two questions with $\rho < 0.001$. Thus, students who used Agri-Learn to prepare for their semester test (Q4) used Agri-Learn more during the semester than students who indicated that they did not use Agri-Learn to prepare for their semester tests. This seems like a trivial statement, but it gives confidence in other derived results.

Table 7: Chi-Square Analysis of Use of Agri-Learn (Question 4) with Improved Knowledge of Subject (Question 14)

	Use of Agri-Learn (Q4)		Improved Knowledge of Subject (Q14)
True	Yes	No	Total
1	1	15	16
2	2	24	26
3	9	35	44
4	11	6	17
5	4	3	7
Tot	27	83	110
Expected	Yes	No	Total
1	8	8	16
2	13	13	26
3	22	22	44
4	8.5	8.5	17
5	3.5	3.5	7
$\chi^2(4, N = 110) =$	1.02E-09		
$\rho <$	0.0001		

Next would be to test the relationship between Question 4 (use Agri-Learn or not) and electronic platform learning-related questions. Question 14 (I have improved my knowledge of the subject using Agri-Learn) was chosen since it had the highest (of the electronic platform learning questions) correlation with Question 4 (see Table 4). The results of this Chi-Square analysis as presented in Table 7 are $\chi^2(4, N = 110) = 1.02 \times 10^{-9}, \rho < 0.0001$.

It is thus clear that a strong relationship exists between the two questions. This indicates that students that made use of Agri-learn to prepare for their semester test also indicated that they had a better understanding of the course content after writing the online test.

2.2.5 Respondent Comments

From the comments of the students the 2 following problems were identified:

- Could not log in;
- 700 point test made students negative.

Students reported that they were unable to use the platform due to problems with the login. Apparently the registration process had a technical problem that prevented students from having a smooth experience. This was also reflected in the Agri-Pedia Technical Report which indicated a lot of login queries that had to be dealt with.

The second problem related to a thorough assignment that was given to students to help them better prepare for their semester test. However, this thoroughness came at a price. The test consisted of 700 marks. Afrikaans students decided to ignore it and reacted in a very negative way towards it. It created the impression that Agri-Learn was bad because it meant extra work for the students. It is, thus, expected that this factor contributed quite substantially to the overall negative response from the Afrikaans students. Subsequently the assignment was no longer made compulsory which, unfortunately, removed the incentive for students to use Agri-Learn.

2.2.6 General Sentiment

From Section 2.2.4 (correlations and Chi-square tests) Question 4 (I have used Agri-Learn to prepare for my semester test) seemed to be a good indicator of the general sentiment of the students. Thus the results of Question 4 is tabled below.

Table 8: Student Sentiment based on Use of Agri-Learn (Question 4).

Q4: I have used Agri-Learn to prepare for my semester test		
Yes	No	Tot
27	85	112
24.1%	75.9%	100.00%

Thus, from Table 8 it can be seen that 24.1% of the students had a positive sentiment by indicating that they have used Agri-Learn, while 75.9% did not.

The next aspect of interest was to determine the impact of Agri-Learn on the students. For this a control is needed. The semester test 1 results could serve as this control since Question 4 of the questionnaire specifically asked if the students used Agri-Learn to prepare for the semester test.

2.2.7 Semester Test 1 Marks and Platform usage

Platform usage data was collected during the period of Monday, 14 – Thursday, 17 March 2016, which was the week before Semester test 1.

The platform usage data consisted of logs generated by the system that indicated at what time which user opened which link. Thus, a click stream could be constructed for each user. The click stream could give an indication of how long approximately each user spent on the platform and what they were looking at.

The students that used Agri-Learn to help prepare for the semester test all performed above the class average semester mark. Their identities cannot be revealed here due to privacy issues.

Some of the students made use of Agri-Learn as a supportive tool in preparing for Semester test 1. Of these students some had spent on average 5 hours on the Agri-Learn platform during the week before Semester test 1. The following results are applicable:

- a) Two of the students who used the Agri-Learn platform in the week before Semester test 1 were absent from the test.
- b) There were 6 students who spent more than 10 hours on the platform during the course of the week prior to the semester test.
- c) The class average for Semester test 1 was 39.3 %, whereas students that used Agri-Learn to prepare averaged 56.2%

From the above it can clearly be seen that students who used Agri-Learn to prepare for their semester test had a clear academic advantage over students that did not make use of it.

2.2.8 Knowledge gained using Agri-Learn

The advantage of the use of Agri-Learn as mentioned above raises the question: How many students gained knowledge by using the Agri-learn platform after the semester test?

Question 14 of the questionnaire asked the students if they have gained knowledge on the course content after they have used Agri-Learn for the online test. Thus, as was evident from Figure 2, there was a clear difference between students that answered Yes to question 4 than those that answered No. Thus, the results of Question 14 need to be explored in some more detail.

Table 9: Question 14 (Increased knowledge after use of Agri-Learn) frequency breakdown based on the answers of question 4 (I have used Agri-Learn to prepare for semester test).

Gained knowledge? (Q 14)		
	Do not use Agri-Learn (No)	Use Agri-Learn (Yes)
Strongly Disagree	15	1
Disagree	24	2
Neutral	35	9
Agree	6	11
Strongly Agree	3	4

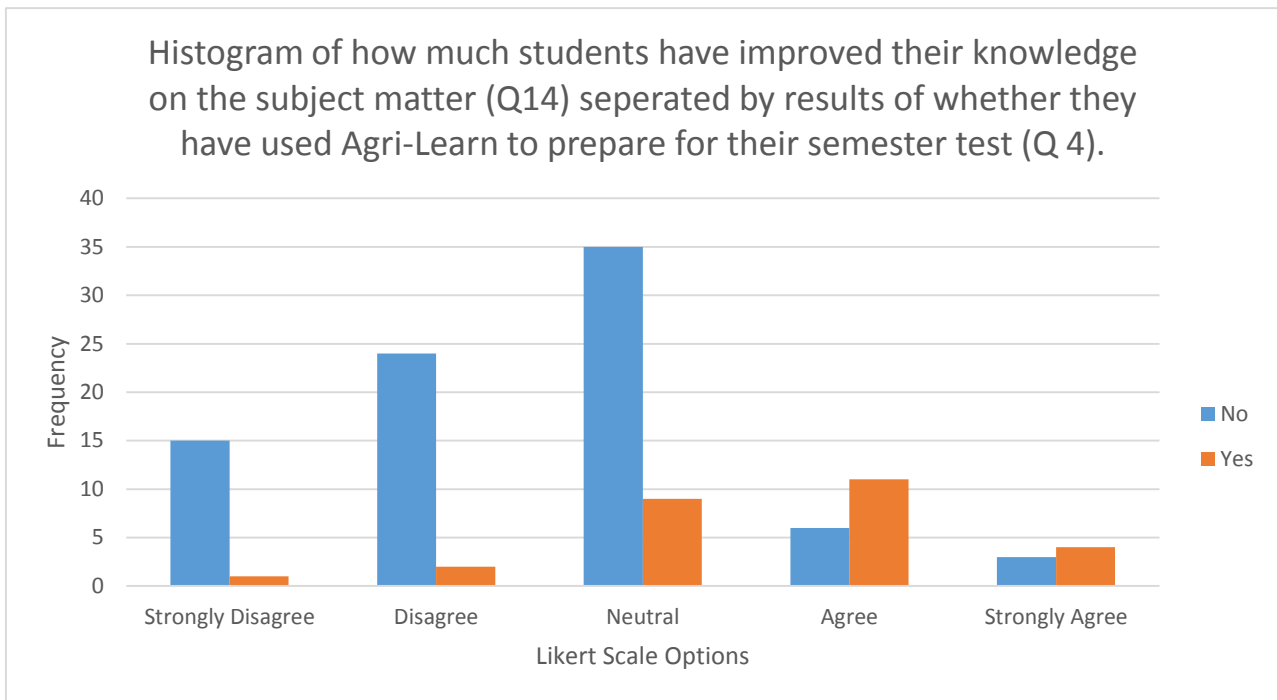


Figure 4 Histogram of Question 14 (Improved knowledge after use of Agri-Learn) broken down by Question 4 (I have used Agri-Learn to prepare for semester test 1)

Figure 4 above shows all the responses to Question 14 where the students indicated whether they have used the Agri-learn platform. Of the 27 that answered Yes to Question 4, only 3 had a negative response, 9 were neutral and 15 were overall positive. Clearly the trend is positive for this group. Therefore, students that used Agri-learn to prepare for semester tests 1 have gained knowledge by using the system. This was evident before, but is now confirmed.

Also evident from Figure 4 is that for the students who have not used Agri-Learn (that answered No to Question 4), the trend is overall negative, with 39 negative responses, 35 neutral responses and 9 positive responses. It is understandable in the light of the problems experienced. However, it should be noted that 9 of the students gave positive feedback, suggesting that some of these students used Agri-Learn after the semester test, and then realised that it positively contributed to their knowledge on the subject.

2.2.9 Semester Test 1 and the Online Agri-Learn Test

After semester test 1 was written, an online Agri-Learn test was presented to the students to encourage them to use the online system for preparation. This test was written by 93 of the students which comprise 83% of the class. The class average for this online test was 66.7%. To protect the students' identities, the data was graphed as a scatter graph in Figure 5 below.

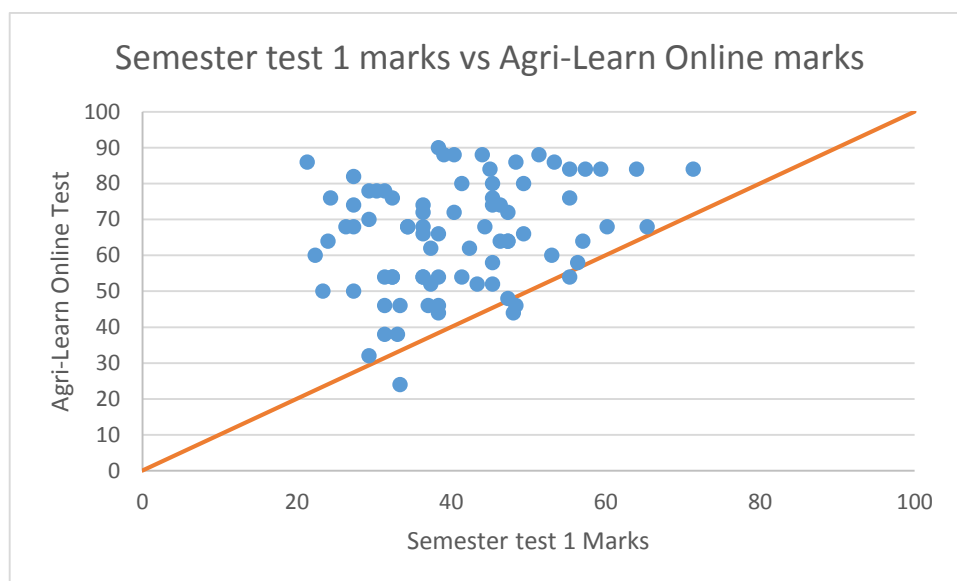


Figure 5: Semester test 1 marks vs. Agri-Learn online test marks

In the Figure 5 above the first semester test marks have been presented against the Agri-Learn online test marks.

From the figure it can see that all the students that participated in the online test have performed better than in the semester test (very few dots below the orange line that represent a 1-1 ratio between the axes). This suggests that students that did very badly in the semester test were able to improve their knowledge on the subject by using the Agri-Learn platform.

3. Examination Questionnaire

3.1 Introduction

A second questionnaire was issued to the same group of students after the written June 2016 examination. Since a short time have elapsed from the first to the second questionnaire, it was not practically possible to solve all the problems identified from the first questionnaire, but some mitigation did, however, occur. To avoid the login problems, the students were given a universal login account to allow them access to Agri-Learn even though it was not linked to their own names. Students were also encouraged to use the platform since results have indicated the potential benefit to improve marks.

The second questionnaire was administered to the students directly after their written examination and thus the entire class completed this questionnaire. It was reported that 136 students wrote the examination, and that 108 questionnaires were returned, of which 5 were blank. Thus, 103 completed questionnaires were received and processed.

3.2 Examination Questionnaire Questions

The second questionnaire had far fewer questions, since the primary goal was only to see the students' attitudes toward the platform after the examination.

Thus the questionnaire had 8 questions in total, divided into 4 sections, namely:

- A. Demographic Information
- B. General Use
- C. Electronic Platform
- D. General Comments and Recommendations

All the questions on the second questionnaire were used / adapted from the first and were treated the same way. Questions 1- 4 of the new questionnaire corresponded to questions 1-4 of the first questionnaire. Question 5 in the second questionnaire was not really a question, and is thus ignored. Questions 6- 8 from section C in the second questionnaire corresponded to questions 12- 14 in the first questionnaire. Section D in the 2nd questionnaire corresponded to Section E from the first questionnaire

The second questionnaire is attached in Appendix B for reference.

3.3 Examination Questionnaire Analysis

Similar analysis procedures that were used for the semester test questionnaire were also used for the examination questionnaire.

3.3.1 Overall Questionnaire Score Percentages

In order to obtain an overall idea of the responses to the examination questionnaires, the percentages are given in Table 10 below.

Table 10: Comparison of Examination Questionnaire Questions with Scores

Question Number	Questions	Question Type	Read as	Percentage
Q 3	Language of class	Frequency	English	50.49%
Q 4	Use of Agri-Learn	Frequency	Percentage of people marked	35.92%
Q 6	More exciting than text book	Ave (out of 5)	General impression	65.85%
Q 7	Encourage fellow-students	Ave (out of 5)	General impression	72.68%
Q 8	Better after using Agri-Learn	Ave (out of 5)	General impression	68.50%
General Comments	General Comments	Frequency	Percentage of people giving a comment	22.33%

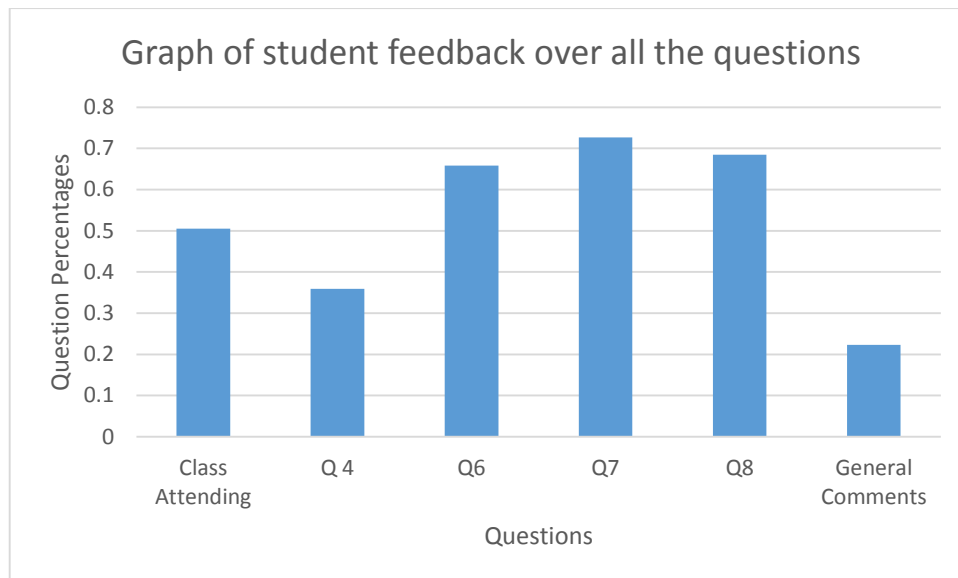


Figure 6: Students' feedback for all the questions

From Figure 6 above it can be seen that the class was almost perfectly divided in Afrikaans and English students with the 50.49% score for class language. For Question 4 (which asked the students if they have used the Agri-Learn platform to prepare for the examination) the students had a 35.92% positive feedback (which is 11% higher from the 24% of the previous questionnaire). Responses to Questions 6 - 8 indicated that the students had an overall positive response to the Agri-Learn platform. The general comments showed that about 22% of the students gave specific feedback.

3.3.2 Using Agri-Learn in Preparation for the Examination

Continuing with the same trend as the previous questionnaire, the differentiation between Questions 3 and 4 with the rest of the questionnaire will be investigated.

Table 11: Questionnaire breakdown by Class Language (Question 3)

Question Number	Questions	Afrikaans Q3	English
Q 4	Use of Agri-Learn	16.33%	53.85%
Q 6	More exciting than text book	53.33%	67.10%
Q 7	Encourage fellow-students	51.11%	77.42%
Q 8	Better after using Agri-Learn	53.33%	71.33%

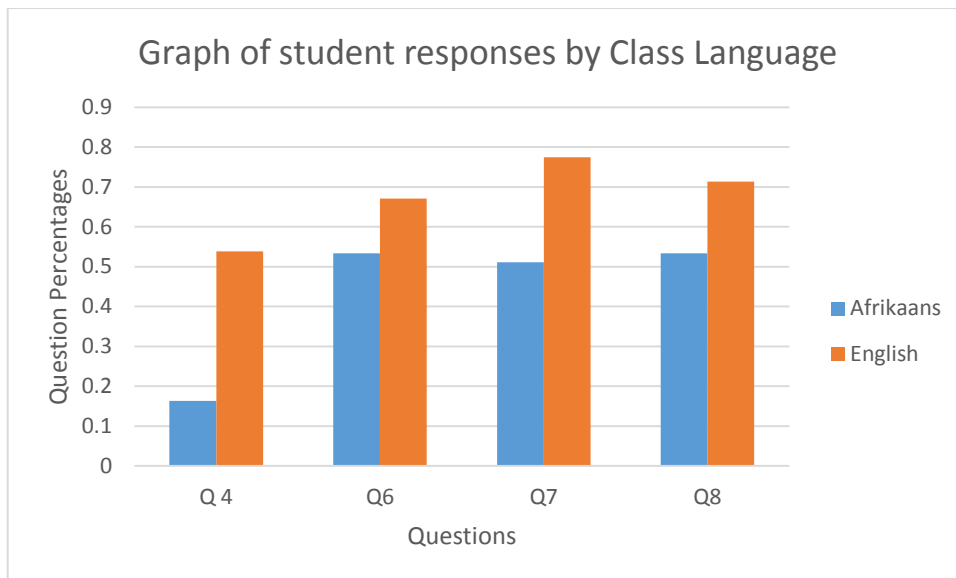


Figure 7: Question 3 (Class Language) against all the Other Questions

From Table 11 and Figure 7 above it can be seen that more than half of the English students (54%) made use of Agri-Learn to prepare for their examinations, while about 16% of the Afrikaans students made use of Agri-Learn.

Questions 6-8 showed that the Afrikaans students had a neutral to a slightly positive attitude, while the English students displayed a more pronounced positive attitude.

Doing the same for Question 4, namely showing trends between students' use of Agri-learn and other questions, Table 12 and Figure 8 are presented below.

Table 12: Trends between Students' Use of Agri-Learn (Question 4) and Other Question Responses for Examination Questionnaire

Question Numbers	Question	Yes	No
Q3 Afrikaans	Attend Afrikaans classes	16.33%	78.85%
Q3 English	Attend English classes	57.14%	44.23%
Q6	More exciting than text book	68.57%	40.00%
Q7	Encourage fellow-students	76.00%	50.00%
Q8	Now better knowledge/understanding	72.00%	25.00%

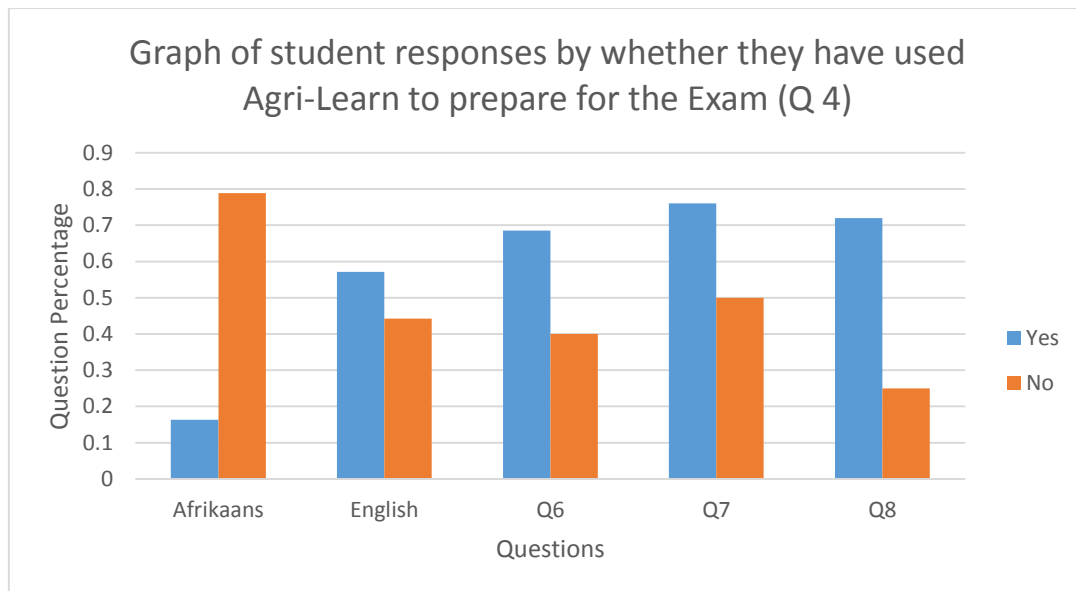


Figure 8: Question 4 (I have used Agri-Learn to prepare for the examination) against the scores of the other questions

From the data above it is clear that the Afrikaans students basically did not use Agri-Learn to prepare for their examinations, with a 78.85% that indicated this fact, while 57.14% of English students did use Agri-Learn to prepare for their examinations. Further of note is that students that used Agri-Learn to prepare had a strong positive reaction to Questions 6 – 8, while students who did not use Agri-Learn for preparation had a neutral (Q 7: encourage other students to use Agri-Learn) to a slight negative (Q 6: Agri-Learn is more exciting than text book) to a strong negative (Q 8: I have better knowledge now after using Agri-Learn) response to questions 6 - 8.

From this we see that students who did not use Agri-Learn to prepare for the examination were neutral in recommending Agri-Learn to other students, meaning they were without opinion. They were also slightly negative in response to using Agri-Learn over the prescribed text book with a 40.0% sentiment. However, students that did use Agri-Learn had a strong positive reaction to using Agri-Learn over the prescribed text book with 68.57% preferring the Agri-Learn platform. Students (75.0%) indicating that they used Agri-Learn to prepare for the examination claimed that Agri-Learn improved their knowledge on the subject. On the other hand, students not using Agri-Learn to prepare for the examination claimed that Agri-Learn did not improve their knowledge, with only a 25.0% positive sentiment.

Presenting the data by showing, per language group (Question 3), who used Agri-Learn (Question 4) to prepare for the examination, Table 13 and Figure 9 follow below.

Table 13: Questionnaire breakdown by both Question 3 (class language) and Question 4 (I have used Agri-Learn to prepare for the examination)

Question Number	Question	Did not use Agri-Learn		Used Agri-Learn	
		Afrikaans	English	Afrikaans	English
Q 6	More exciting than text book	20.00%	60.00%	62.86%	70.00%
Q 7	Encourage fellow-students	20.00%	80.00%	60.00%	80.00%
Q 8	Now better knowledge/ understanding	20.00%	60.00%	62.86%	74.29%
Section D	General Comments	12.20%	0.00%	37.50%	53.57%

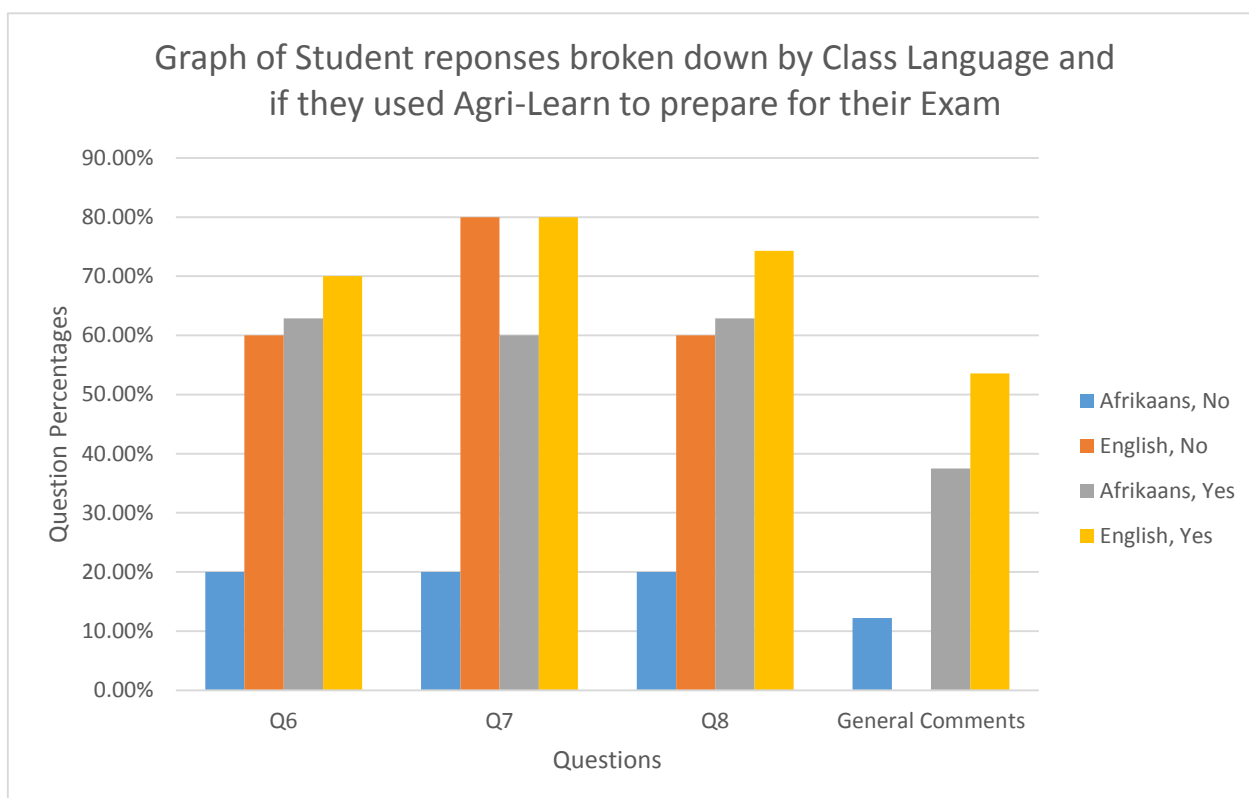


Figure 9: Student responses broken down by class language (Q 3) and if they have used Agri-Learn to prepare for the examination (Q 4)

From the above we can deduce that Afrikaans students that did not use Agri-Learn to prepare for their examination had a very negative opinion of Agri-Learn. Their comments from section D were very negative. However, all other groups (Afrikaans and students who used Agri-Learn, as well as English students who did not use it) had a positive reaction, as can be seen from questions 6 to 8. Then English students that used Agri-Learn (answered yes to question 4) had the most comments. Most of these comments were student suggestions that indicated that the Agri-Learn system login needed to be fixed, and some other technical issues that needed to be addressed, such as user experience and access to the rest of the system. There were also very positive comments about the platform where students complimented the platform claiming that it was very useful, and that they would like to use it in their other modules.

It is thus clear that, overall, the students had a greater positive reaction towards the Agri-Learn platform when preparing for the examination than what was experienced in the previous questionnaire (used in conjunction with semester test 1).

3.4 Examination Results

After the second questionnaire results were processed, the examination results were collected from the lecturer. The students who identified themselves were matched with their examination results, but to protect their identities this information cannot be displayed here. Instead the aggregated information will be displayed.

Table 14: Student Examination Averages

Group	Average (%)		
	Semester Mark Calculated	Exam 1	Final 1
Entire Class	59.17	53.23	58.43
Identified Students	66.08	64.96	66.04
Unidentified Students	55.89	47.65	54.81
Identified: Q4 –Yes	60.85	61.80	61.60
Identified: Q4 – No	69.82	67.21	69.21

From the table above it can thus be seen that students who identified themselves, did better on average than the students who did not identify themselves. It can thus be said that students who are willing to identify themselves are more confident about their marks and also willing to stand by what they say, and by implication, willing to reveal their marks.

Furthermore, the students' data in Table 14 was divided between students that indicated that they have used Agri-Learn to prepare for their examination and those who have not (Question 4). From that division it can be seen that students who did not use Agri-Learn obtained a very high average (final mark 69.21%), but this group is not of interest since as previously stated that they were confident about their marks. The other group that also obtained more than the class average that indicated that they used Agri-Learn to prepare are of more interest. These are the students that needed the extra resources and were rewarded with better marks as a result (final mark 61.60%).

Of the students who indicated that they used Agri-Learn and that were identifiable, 90% also indicated that they attended the English classes, while only 30% of students that did not use Agri-Learn indicated that they attended the English classes. This again is consistent with the previous results that the Afrikaans students have a general negative attitude toward Agri-learn, while English students were more open to it. It is, thus, also clear that English students who indicated that they needed the help more, also benefited the most from Agri-Learn.

4. Combining the Results

When the results of Questionnaire 1 and Questionnaire 2 is brought together, a picture of growth is painted.

As was previously stated, Question 4 from both of the questionnaires (which indicated if the student used Agri-Learn to prepare for the semester test or the examination respectively) was used as an overall indicator of the attitude of the students. In the first questionnaire there was an overall positive attitude of 24%, while this increased to 35% in the second questionnaire.

When the other similar questions were considered, the results can be seen in Table 15.

Table 15: Comparison of the Results of Questionnaire 1 and Questionnaire 2

Question Number	Question	% of responses that marked <i>Neutral, Agree or Strongly agree</i>
QUESTIONNAIRE 1		
Q 10	Will use Agri-Learn for electronic assignments	70%
Q 11	Prefer electronic interactive tests to written tests	61%
Q 12	Agri-Learn is more exciting than prescribed material	50%
Q 13	Will encourage other students to use Agri-Learn	64%
Q 14	Better knowledge of units 1-3	61%
Q 15	Will use Agri-Learn to prepare for examination	55%
QUESTIONNAIRE 2		
Q 6	Agri-Learn is more exciting than prescribed material	85%
Q 7	Will encourage other students to use Agri-Learn	85%
Q 8	Agri-Learn has increased my knowledge on the subject	87%

The table above shows the percentage of students who marked *neutral, agree or strongly agree* on the questionnaire Likert scale questions. This shows that students overall gave a positive response, and even more positive response for the second questionnaire.

Question 12 from questionnaire 1 and Question 6 from questionnaire 2 are the same, and the response to the two questions showed a 35% increase in terms of positive opinions on the excitement of Agri-Learn compared to the prescribed material. Similarly Question 13 from questionnaire 1 and Question 7 from questionnaire 2 are identical and show a 21% increase in positive response toward encouraging other students to use Agri-Learn. Question 14 from questionnaire 1 and Question 8 from questionnaire 2 also show a 22% increase in positive responses that Agri-Learn improved students' knowledge on the subject.

5. Conclusion

This report started by digitalizing the results from the Agri-Learn Online Questionnaire. The digital information was graphed and discussed. Some problems occurred within the Agri-Learn platform and were indicated. The rest of the report delved into the specific aspects of the questionnaire results to understand what the students tried to express.

The results indicated that Question 4 which asked students if they have used Agri-Learn to prepare for the first semester test, was a good indicator of the students' general sentiment. It was observed that the overall sentiment was negative toward Agri-Learn during the first questionnaire. The problems could be attributed to a few reasons: Students claimed that they did not see the need, or they did not have the time. Others claimed that they experienced technical problems or that an Agri-Pedia test unrelated to the rest of their curriculum made them negative toward the overall experience.

Some students, however, did take the time to explore Agri-Learn, and these students' efforts were rewarded with better than class average marks. These students performed better in the semester test on average compared to students who did not use Agri-Learn to prepare for their semester test.

It was also found that students who used Agri-Learn after the first semester test improved their knowledge of the subject matter by using the platform.

From the second questionnaire focussing on the examination preparation, it became evident that more students used the Agri-Learn platform to prepare for their examination than those who used it to prepare for their semester test. Overall, the students' opinions also improved toward Agri-Learn. The Afrikaans students were more negative about the platform, while the English students generally had an opposing opinion, claiming that it helped them a lot.

Agri-Learn has the potential to add significant educational value to students, but the technical and presentation problems should be addressed. In this modern age people are very critical and require almost perfect service to consider something acceptable.

Generally students who made use of Agri-Learn to prepare for their examinations did indeed obtained higher average marks than students that did not make use of Agri-Learn. It can, thus, be concluded that Agri-Learn is able to add value to students and their curriculums.

From a totally objective, unbiased position it is important for me to draw the attention to the fact that, despite all the good intentions and efforts from the Agri-Pedia team, this project is doomed should the Faculty of Natural and Agricultural Science (specifically the relevant Agricultural departments) not totally buy into this concept. Without clear support, motivation and dedication from the lecturing staff and official incorporation of Agri-Learn into the curriculum and assessment strategy, students will find it difficult to cope with and accept the (proven) advantages of Agri-Learn if they are only able to view it as additional workload from outsiders for which they do not have the time and for which they do not get tangible credit for.

Appendix A: The First Agri-Learn Platform Questionnaire

Agri-Learn Platform Questionnaire

The purpose of this questionnaire is for the Agri-pedia team to obtain feedback from the ANIG 2614 students regarding their use (or not) of the Agri-Learn platform.

The results of the questionnaire will be used to make improvements in order to ensure that the students receive the best possible benefits from this platform.

Please answer the questions as specified. Use an X for making a selection in the square boxes and circles.

A. DEMOGRAPHIC INFORMATION

1. STUDENT NUMBER: _ _ _ _ _ (Optional)
2. GENDER: Male Female
3. CLASS ATTENDING: Afrikaans English

B. GENERAL USE

4. I have made use of the Agri-Learn platform in preparing for semester test 1.
Yes No

5. If your answer to question 4 was 'No', answer question 5, otherwise skip to question 6.

My reason(s) for not registering is the following (you may mark more than 1 option):

- | | | |
|-------|--|--------------------------|
| 5.1.1 | I did not see the need | <input type="checkbox"/> |
| 5.1.2 | I did not have the time | <input type="checkbox"/> |
| 5.1.3 | I will not use the system anyway | <input type="checkbox"/> |
| 5.1.4 | It does not form part of our curriculum | <input type="checkbox"/> |
| 5.1.5 | The marks for using the system is negligible | <input type="checkbox"/> |
| 5.1.6 | The lecturer does not use the system | <input type="checkbox"/> |
| 5.1.7 | Other (<i>please specify</i>) _____ | |
-

6. I feel that the Agri-Learn platform is necessary for this module:

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. I have used the Agri-learn platform during the semester so far:
- | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Never | Once | 2-5 times | 6-10 times | More than 10 times |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

8. I will use the Agri-Learn platform more frequently if (*you may mark more than 1 option*):
- a. It formed part of our curriculum
 - b. It contributed more substantially towards my semester mark.
 - c. Our lecturer used it in class.
 - d. It replaced our current pre-scribed text book.
 - e. We could use it in our practical session.
 - f. We could have more practical sessions in the module.
 - g. Extra classes were presented where it could be used.
 - h. It was used by more modules in the faculty.
 - i. Other (*please specify*) _____

C. TEXT BOOK

9. The prescribed text book for this module is (*make a X somewhere between the two extremes*):
- | | | | | | | | | |
|---------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|
| Inadequate | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Adequate |
| Frustrating | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Enjoyable |
| Dull | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Exciting |
| Difficult to read | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Easy to read |
| Difficult to follow | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Easy to follow |

D. ELECTRONIC PLATFORM

10. I would perform electronic assignments based on the Agri-Learn platform if expected to:
- | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
11. I prefer writing electronic interactive tests to written tests:
- | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
12. I find the Agri-Learn platform more exciting to work from compared to only using my prescribed text book:
- | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

13. I would encourage my fellow students to use the Agri-Learn platform:
Strongly disagree Disagree Neutral Agree Strongly agree

14. Against the background of the very poor marks achieved on units 1 – 3 in semester test 1, I believe that after doing the first online Agri-Learn test on the same units, I now have better knowledge and understanding of the content involving these units.
Strongly disagree Disagree Neutral Agree Strongly agree

15. I will use the Agri-Learn platform in preparing for the examination.
Strongly disagree Disagree Neutral Agree Strongly agree

E. GENERAL COMMENTS

Thank you for taking time to fill in this questionnaire

Appendix B: The second Agri-Learn Platform Questionnaire

Agri-Learn Platform Questionnaire 2

The purpose of this questionnaire is for the Agri-pedia team to obtain feedback from the ANIG 2614 students regarding their use (or not) of the Agri-Learn platform in terms of preparation for the examination.

The results of the questionnaire will be used to make improvements in order to ensure that the students receive the best possible benefits from this platform.

Please answer the questions as specified. Use an X for making a selection in the square boxes and circles.

B. DEMOGRAPHIC INFORMATION

1. STUDENT NUMBER: ___ ___ ___ ___ ___ ___ ___ ___ ___ (Optional)
2. GENDER: Male Female
3. CLASS ATTENDING: Afrikaans English

B. GENERAL USE

4. I have made use of the Agri-Learn platform in preparing for this examination. Yes No
5. If your answer to question 4 was 'No', you do not have to complete the form any further. Thank you!
If your answer was 'Yes', please continue with the questions below.

C. ELECTRONIC PLATFORM

6. I find the Agri-Learn platform more exciting to work from compared to only using my prescribed text book:
Strongly disagree Disagree Neutral Agree Strongly agree
7. I would encourage my fellow students in future to use the Agri-Learn platform:
Strongly disagree Disagree Neutral Agree Strongly agree
8. In using the Agri-Learn information to prepare for the examination, I now have better knowledge and understanding of the content involving units 2 - 4.
Strongly disagree Disagree Neutral Agree Strongly agree

D. GENERAL COMMENTS AND RECOMMENDATIONS

Thank you for taking time to fill in this questionnaire