Do Students Understand Learning Outcomes on Courses in General and in T176, T192, T193 and T194 in Particular?

eSTEeM Project Report

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Executive Summary

Anecdotal evidence from ALs tutoring on some Level 1 Engineering modules seems to show that students on Engineering modules do not fully engage with the Learning Outcomes (LOs). This project aimed to find out if the way in which LOs are written may be a barrier to learning as LOs are a key part of module design.

Four Level 1 modules were studied (T176, T192, T193 and T194). There were four Phases to the project which ran from 2019 to 2020.

Phase I – The same six Readability Tests from four websites, giving a total of 24 tests, were used on the six LOs from module T176.These tests revealed that there were problems with the number of syllables per sentence, the length of sentences and the Reading Age needed to understand the LOs.

In addition, each module was analysed to identify whether there were assignments (TMAs and EMAs) which specifically asked students to engage with LOs in these assignments, the assumption being that students would have to engage with the LOs to complete them. We found that only T176 directly used LOs in TMAs and the EMA.

Phase II – armed with this data, we devised a student activity which was delivered face-to-face at a T176 residential school at Bath University in 2019 to collect more data. 37 students took part in groups of 4/5 and the task took about 20 minutes to deliver. Five out of the six LOs in T176 were used and a technique called a 'Group Administered Interactive Questionnaire' (GAIQ) (Yerushalmi, E., Henderson, C., Mamudi, W., Singh, C., Lin, S.; (2012) was used. The results were used to design our two student surveys in Phases III and IV using Qualtrics software and delivery on-line.

Phase III was a survey delivered to 376 students in 2020 as a mixture of Likert psychometric style, open ended, closed, rating type and Multiple-Choice questions. 16 questions were developed.

The Likert psychometric questions used only four choices (rather than the five usually used) to avoid respondents choosing the neutral option as a 'sitting on the fence' choice and forcing a decision. A delay in distribution for Phase III (COVID-19!) resulted in T176 being surveyed in mid- module, rather than upon completion. These students had also completed modules T192 – T194.

Phase IV was a second survey delivered to 1820 to students who had completed T176, T192, T193 and T194 with some minor alterations to several questions as a result of Phase III. Both surveys were then compared.

This comparison showed that many students were frustrated by the structure of some LOs in their modules, particularly in the length of sentences and the amount of information in a sentence they were expected to understand. The Phases II, III and IV therefore provided evidence on the analysis we had carried out in Phase1, particularly in the integration of LOs into assignments to improve engagement. Students also made useful suggestions on how the design of LOs could be improved. These improvements will be made available to course teams.

Aims and scope of this project

To establish level of academic literacy needed to understand the meaning and significance of Learning outcomes (LOs) and use them effectively. LOs should be an integral part of the student experience throughout their journey.

The specific goals of this project were to:

(i) Collect data on student perceptions of LOs on some Level 1 engineering modules.

(ii) Extend this research into other Faculties eventually.

(iii) Identify any barriers to learning created by the LO design.

(iv) Use project outcomes to provide suggestions on how LOs can be written to support learning.

(v) Provide support resources for students to aid LO engagement more effectively.

Activities

The overall approach was to use opportunities from tutoring on Level 1 engineering modules to collect appropriate data using F2F student activities and student surveys. The planned activities were in four Phases as outlined in Figure 1.

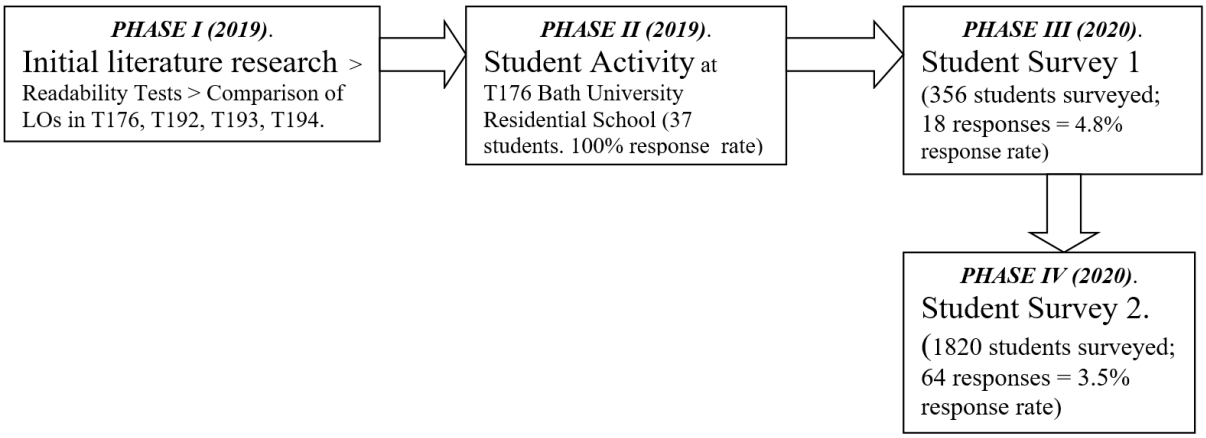

Figure 1. Flow chart illustrating project phases.

Phase 1 Activities (2019)

Readability Tests

Six on-line computerised Readability Tests were applied to the six LOs on module T176 to establish whether these LOs were within the reading age of the target audience. See Table 1 under 'Findings'.

The six tests were:

- Flesch-Kincaid Reading Ease (1975)
- Flesch-Kincaid Grade level (1975)
- Gunning Fog Score (1952)
- SMOG Index (1969)
- Coleman Liau Index (1975)

- Automated Readability Index (1967)

The same six tests were accessed on four online readability testing websites:

- Webfx.com (Accessed July – October 2019)
- Readabilityformulas.com (Accessed July-October 2019)
- Online-utility.org (Accessed July – October 2019)
- Prepostsco.com (Accessed July – October 2019)

Therefore 24 tests were applied to each of the six LOs in T176.

Comparison of the LOs and student activities in T176, T192, T193 and T194.

We were interested whether there was any connection between the assignments (TMAs and EMAs) students had to complete and the LOs in all the modules chosen. In other words: if a module had assessed questions which mentioned LOs in them, these may encourage students to engage more with the LOs on a module.

These are called 'DART's or **D**irected **A**ctivities **R**elated to **T**ext and are activities that are related directly to the text being studied (Davies, F. & Greene, T. (1981.) This echoes ideas of John Biggs' 'Constructive Alignment' which Kinash and Knight (2013) describe as being "Coined by John Biggs (2011) and arose out of a portfolio assessment designed to ask students to provide evidence of their learning, or how they achieved the learning outcomes of the subject."

Please see the results in Table 2 'Findings'.

Phase II Activities (2019)

As preparation for designing the survey questions (Phases III and IV) Alan Yate and Steve Dutch were tutoring at the T176 Residential School at Bath University for a week in 2019. We designed an activity for use face-to-face with our tutor groups (37 students in total) and gained permission to use it during one of the tutorial sessions.

5 out of the 6 LOs on T176 were used as the basis of the activity . Each group of 4/5 students used a different LO but the same activity questions, some individual work, group discussion and then individual work after the discussions. The tasks took 20 minutes for each group. A copy of the questions each group were given is included in Appendix 2 (i) and the results in 'Findings' below.

The technique is called a 'Group Administered Interactive Questionnaire' (GAIQ) (Yerushalmi, E., Henderson, C., Mamudi, W., Singh, C., Lin, S. 2012). Figure 2 illustrates the stages in the use of this Group Administered Interactive Questionnaire.

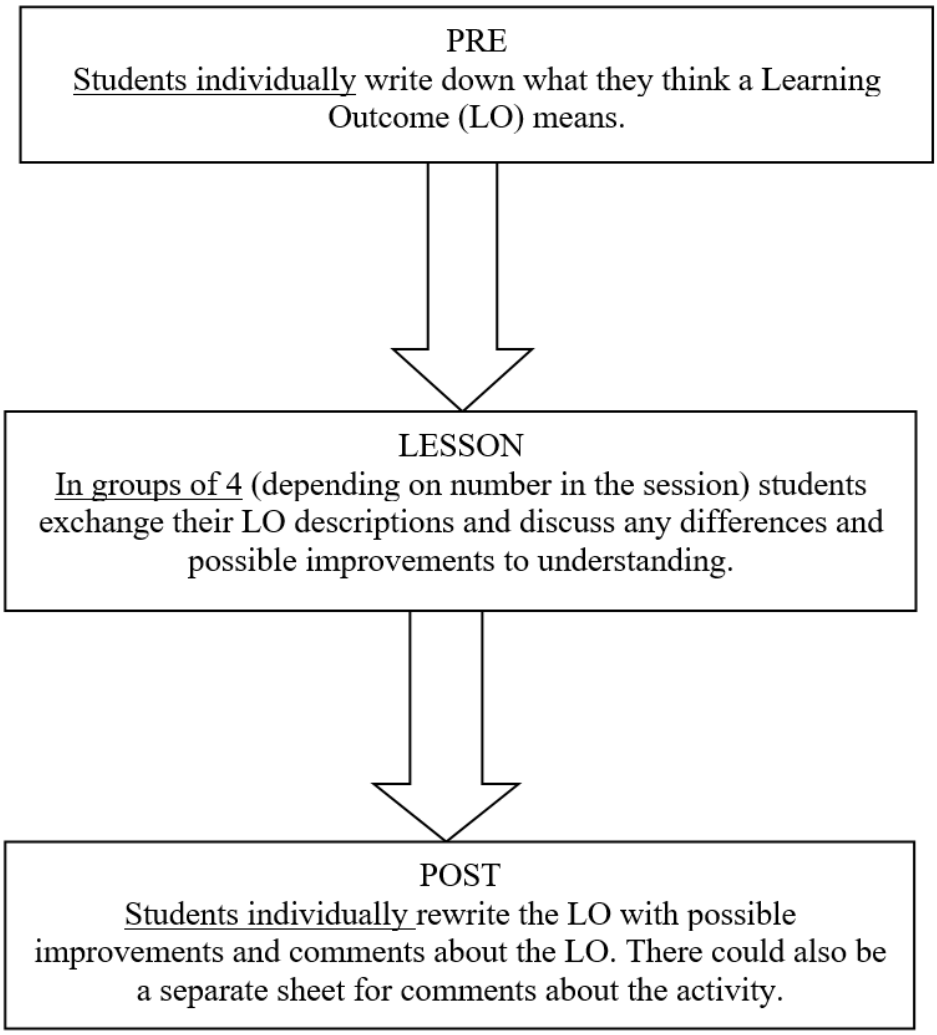

Figure 2. Flow diagram illustrating the stages in the 'group' administered interactive questionnaire (GAIQ)

Phase III Activities (2020)

After analysing the responses to the student focussed activity at Bath University, we intended to repeat this at the next residential school in 2020 but COVID-19 cancelled the residential school. We therefore designed a computerised survey using Qualtrics software with a mixture of Likert psychometric style, open ended, closed, rating type and Multiple-Choice questions. The Likert psychometric questions used only four choices (rather than the five usually used) to avoid respondents choosing the neutral option as a 'sitting on the fence' choice and forcing a decision.16 questions were developed and delivered to 376 students (18 responses; 4.8% response rate). Unfortunately, due to Covid-19 the survey was delivered to students studying T176 half-way through the module but all the students had completed T192, T193 and T194. The results were analysed and used to design the survey in Phase IV.

Phase IV Activities (2020)

This was the second on-line survey delivered to 1820 students (64 responses, 3.5% response rate) who had all completed T176, T192, T193 and T194. Some questions were edited as a result of the responses to Phase III in order to improve clarity. We felt this was an important process as writing

survey questions tends to be an iterative process. The changes made were either one word or reworking of the stem to a question to aid clarity for respondents.

Findings

Part of the research question regarding – "learning *outcomes in general…"* was not answered due to time constraints. However, that regarding – *"learning outcomes…in courses T176, T192, T193 and T194 in particular"* was completed.

Phase 1 – (i) Readability Testing (2019)

Table 1. The results of the computerised readability analysis of T176 learning outcomes 1 to 6.

TITLE OF SCORING INDEX	WEBSITE ADDRESS AND US GRADE SCORES FOR READABILITY TESTS				
	Webfx.com*	**Readability formulas.com	**Online-utility.org	**Prepostsco.com	Avg US Grade Score
Flesch-Kincaid Reading Ease (1975)	29.1 – Low readability *Difficult*	27.9– *very difficult*	20.15	16.5	23.4
Flesch-Kincaid Grade level(1975)	13.8 Medium readability	13.7	14.92	17.2	14.9
Gunning Fog Score (1952)	17.3 – Low readability *Difficult*	17.3	16.27	-	16.8
SMOG Index (1969)	12.4– High readability *Easy*	12.3– *college level.*	15.35	-	13.3
Coleman Liau Index (1975)	17.1– Low readability *Difficult*	16.0– *Graduate College.*	15.96	18.6	16.9
Automated Readability Index (1967)	14.1 Medium readability	14.5	14.30	18.6	15.4
Summary of content from T176 Learning Outcomes 1 to 6 (from the four websites)					
No. of sentences	12			8	10
No. of words	222			200	211
No. of complex words	55				
% of complex words	24.77%				
Av. Words per sentence	18.50			48.8	33.6
Av. Syllables per word	1.88	*(2 – Grade level 16 – very*	*Improve sentence structure of*	2 - *Longest sentence is LO4.*	

		difficult to read)	*LO3, LO4, LO5, LO6.*		

Notes

The average grade scores (US) of all readability tests (last column) = 16.8 + 5 = 21.8 (22 years UK).

*Webfx.com provided additional data in column 2.

** Readabilityformulas.com, Online-utility.org and Prepostsco.com provided comments on LOs

As a rough guide US grade level 1 corresponds to ages 6–8. Reading level grade 8 corresponds to the typical reading level of a 14-year-old US child. Grade 12, the highest US secondary-school grade before college, corresponds to the reading level of a 17-year-old.

The six readability tests used in Phase I to test LOs in the T176 module indicated problems related to sentence length. This was measured manually by counting the number of syllables per sentence and the number of words per sentence for each LO in T176 (see Table 2). The manual analysis confirms the comments made by the computerised testing that Learning Outcomes 4, 5 and 6 would seem to pose problems to some readers (especially those whose second language is English) because the sentence length is too long and the average number of syllables per sentence is considerably different for LO's 1 to 3 and 4 to 6.

Table 2. Manually calculated results for T176 Learning Outcomes 1 to 6.

Learning Outcome (T176)	**Syllables per sentence**	**Words per sentence**
1	28	19
2	35	17
3	35	17
4	48	43.5
5	57	31
6	48.5	24

It can be seen clearly that LOs 1-6 for T176 show significant variation in the T176 LO syllables number per sentence. The adjusted figures for average reading age gave a UK value of 22 years – which might pose problems for students with English as a second language. In addition, Readability testing provides a guide for authors on the consistency of LO student accessibility.

Phase 1 – (ii) Comparing assignments where Learning Outcomes are directly mentioned in T176, T192, T193 and T194.

Table 3. Comparing assignments where Learning Outcomes are directly mentioned in T176, T192, T193 and T194.

Module	**TMA01**	**TMA02**	**TMA03**	**Final Assessment**
T176	Yes	Yes	N/A	Yes (EMA)
T192	No	No	N/A	Yes(emTMA03)
T193	No	No	N/A	Yes(EMA)
T194	No	No	No	XNo(CME81)

Analysis of assignments on the above modules showed that:

(i) Only T176 had TMA assignments, EMA questions and activities, or DARTs (Directed Activities Related to Text) that directly mentioned LOs throughout the module. Therefore students had plenty of engagement with LOs.
(ii) T192/3 had no TMA questions related to LOs but did have a question in the EMAs. Therefore they had little prior engagement with LOs to help them in the EMAs.
(iii) T194 had no DARTs in either TMAs or the EMA (see Appendix 3, Table 4). Therefore engagement with LOs for this module was not encouraged in the module design. So why have LOs in the first place!

Phase 2 – Student Activity T176 (Bath University, 2019)

The *First stage* (see Figure 2)showed from their explanations that 83.8% students appeared to understand what the LO statement meant (n = 37), though that leaves 16.2% who couldn't explain in writing what the LO meant.

The *Second stage* showed that, of the 37 students surveyed, 76% held similar views about the LOs studied and their comments about improvements confirmed the results of the readability testing in Phase I i.e. that simpler language was needed in some of the LOs surveyed.

The *Third stage* of the student activity (Figure 2) had four questions for individual work – see Tables 4, 5, 6 ,7 and 8 below.

Table 4. Question: Did you read the Learning Outcomes at the start of the course?

Learning Outcome (LO)	YES	Yes %	NO	No %	NO ANSWER	No Answer %	Number of Students Sampled	Average response (Y/N/No answer)
LO1	3	50%	2	33.3%	1	16.7%	6	Y
LO2	2	33.3%	4	66.7%	0	0.0%	6	N
LO3	6	60%	3	30%	1	10%	10	Y
LO4	1	12.5%	3	37.5%	4	50%	8	N
LO5	4	57%	0	0.0%	3	43%	7	Y

Total students sampled = 37.

Overall Result = Yes.

Table 5. Question: Did you understand what they mean?

Learning Outcome (LO)	YES	Yes %	NO	No %	NO ANSWER	No Answer %	Number of Students Sampled	Average response (Y/N/No answer)
LO1	2	33.3%	3	50%	1	16.7%	6	Y
LO2	2	33.3%	4	66.7%	0	0.0%	6	N
LO3	3	30%	5	50%	2	20%	10	N
LO4	1	12.5%	3	37.5%	4	50%	8	No answer
LO5	0	0.0%	2	28.6%	5	71.4%	7	No answer

Total students sampled = 37.

Overall Result = No.

Table 6. Question: Did you only read the Learning Outcomes when they appeared in the first TMA?

Learning Outcome (LO)	YES	Yes %	NO	No %	NO ANSWER	No Answer %	Number of Students Sampled	Average response (Y/N/No answer)
LO1	3	50%	1	16.7%	2	33.3%	6	Y
LO2	5	83.3%	1	16.7%	0	0.0%	6	Y
LO3	7	70%	3	30%	0	0.0%	10	Y
LO4	2	25%	2	25%	4	50%	8	No answer
LO5	3	43%	0	0.0%	4	57%	7	No answer

Total students sampled = 37.

Overall Result = Yes.

Table 7. Question: Did you refer to the LOs after the first TMA?

Learning Outcome (LO)	YES	Yes %	NO	No %	NO ANSWER	No Answer %	Number of Students Sampled	Average response (Y/N/No answer).
LO1	2	33.3%	3	50%	1	16.7%	6	Y
LO2	2	33.3%	4	66.7%	0	0.0%	6	N
LO3	3	30%	5	50%	2	20%	10	N
LO4	1	12.5%	3	37.5%	4	50%	8	No answer
LO5	0	0.0%	2	28.6%	5	71.4%	7	No answer

Total students sampled = 37.

Overall Result = Yes.

Table 8. Question: Would you have bothered with the LOs if they hadn't been included in a TMA?

Learning Outcome (LO)	YES	Yes %	NO	No %	NO ANSWER	No Answer %	Number of Students Sampled	Average response (Y/N/No answer).
LO1	0	0.0%	4	66.7%	2	33.3%	6	N
LO2	2	33.3%	4	66.7%	0	0.0%	6	N
LO3	3	30%	6	60%	1	10%	10	N
LO4	0	0.0%	4	50%	4	50%	8	N/No answer
LO5	0	0.0%	1	14.3%	6	85.7%	7	No answer

Total students sampled = 37.

Overall Result = No.

Student responses confirmed the results of readability testing (i.e., some LOs would benefit from some language simplification). The results of this activity are shown in Appendix 2.

Including a question on LOs in the first T176 TMA may incentivise student engagement. However, the incentive to engage with LOs seems to be short lived after the first TMA - as

LOs were not perceived to be important to students for this Level 1 student sample.

*DARTs or **D**irected **A**ctivities **R**elated to **Text**. are activities that are related directly to the text being studied (Davies, F. & Greene, T. 1981). This echoes ideas of John Biggs' 'Constructive Alignment' which Kinash and Knight (2013) describe as being "*Coined by John Biggs (2011) and arose out of a portfolio assessment designed to ask students to provide evidence of their learning, or how they achieved the learning outcomes of the subject."* Kinash and Knight make some pertinent comments about LOs e.g.

> *"Words like 'know' and 'understand' are vague."*
>
> *"It may also be useful to inform your students of the relevant tasks associated with each word."*
>
> *"It is therefore important to write your learning outcomes in a way that is explicit, unambiguous and in plain language."*
>
> *"Use plain, direct and accessible language. Avoid complex or long LOs. Use short and succinct phrases that still convey the overall message."*

However, no research evidence for these (useful) tips could be found to support them. This is one of the purposes of this project.

Phases 3 and 4 – Comparison of survey's 1 and 2 results.

Survey design

The 16 questions in Surveys 1 and 2 used either Likert psychometric scales, open ended questions, closed questions, rating questions or Multiple-Choice types. Qualtrics software was used to prepare and analyse the raw data. A four-point Likert Scale was chosen to avoid respondents opting for the 'safe' option of the third point (middle) response i.e. forcing a decision. When students were asked if they knew where LOs were in their modules, those modules where LOs were directly mentioned in assignments scored more highly than those where LOs were either totally absent in assignments or very poorly represented. Please see Table 3 (above – Phase I) for the comparison between T176, T192, T193 and T194.

Students were asked to choose 4 out of 10 phrases they associated with LOs. There were fewer negative responses from students who had completed their modules but an increase in negative responses from those students whose modules did not link assignment questions to the LOs.

In answer to the open question *"If you have another phrase that you think describes what a Learning Outcome is to you, please write it in the box below"* many students in both surveys (and the student activity at Bath University) could describe the 'function' of LOs in their modules but there were some who thought that LOs were "*more relevant for course design than a learning student trying to cram study in between other commitments." A*n illuminating observation i.e., that LOs were not written for students but for the academics designing modules.

Both surveys show student concerns about understanding the wording and content of LOs and that they 'understand' the reason for having LOs, but not necessarily what they mean. Also, both surveys indicate that students do read LOs throughout a module and this tends to increase as students work through the module resources i.e., those who have completed a module engage with LOs more than those who are only part- way through.

The 'importance' of LOs to students' success in a module was also measured as a check for consistency among questions in the surveys. This showed that the link between students' perceptions of success and the way in which LOs were incorporated in the design of the module was still an important factor (see Table 4).

Table 9. Comparing the percentage of responses for Learning Outcomes as 'Very Important' to 'Moderately Important' in each survey. Question: Please rate how important the Learning Outcomes were to your success on the module(s)?

Module	**First survey**		**Second survey**	
	No. of responses (N = 18)	**% responses**	**No. of responses (N = 64)**	**% responses**
T176	15	83.3%	49	76.5%
T192	11	61%	45	70.3%
T193	10	55.5%	44	68.7%
T194	10	55.5%	43	67.2%

Results in Table 9 indicate a decrease in the relative 'importance' students attached to LOs from T176> T192 > T193 > T194. This supports findings shown in Table 3 where we note; only T176 has LO activities throughout the module, T192/3 has fewer activities / TMA DARTs questions and T194 has no LOs in Activities, TMAs or the EMA.

We felt that it was important to obtain data from students about their interpretation of what they thought a learning outcome meant as well as how important it was. So, the cohort for Survey 1 contained students who were working through T176 plus students who had completed T192 – T194. The cohort for Survey 2 contained fewer T176 students than students who had completed T192 – T194. This was a useful difference as it gave us more data about what students 'understood' about the meaning of a LO.

In answer to multiple choice questions in both surveys, the data showed that most students 'understand' what LOs are for from the point of view of 'content' but there are still some students who are uncertain of the 'purpose' of LOs in a module. For example, some students relate LOs to the academic planning of courses (as there were in the Bath activity) suggesting students do not see LOs as being 'for them'. However, students who have completed modules are less likely to think that LOs have "*no purpose as far as I can tell".* Students who are still studying modules suspect that LOs are there to '*assess me'* whereas those who have completed modules are more likely to think that LOs are there "*to help me assess myself".*

To test the Readability analysis in Phase I, Surveys 1 and 2 contained a question asking students about the grammatical structure and the words used in LOs. The results were encouraging as they suggested that, as students work through a module, their literacy skills improve, helping them 'understand' LOs. However, the evidence from both surveys suggests students still find difficulty with words that are new to them. Perhaps a glossary to help students might be beneficial (especially those who have English as a second language). This evidence was also reflected in the findings from another part of both surveys.

Turning to the syntactic 'structure' of LOs, which was another of the features identified in the readability testing of Phase 1, we included a question on this aspect and found that many respondents expressed concern about the length and complexity of LOs. This confirmed our Phase 1 conclusion that many LOs are too long and complicated. Thus, we have provided data to support the suggestions of Kinash and Knight (2013) quoted above.

Another aspect implicit in the design of LOs is the assumption of the authors of the literary skills necessary to identify their 'key words' in a LO so they can be sure they have demonstrated the LO in their studies. To this end we included a question which tested for this. The results were encouraging, most students could identify a key word or phrase but there are still a proportion of students who may need help on how to do this.

Suggestion – perhaps include in the module resources some examples of statements with key words or phrases in them? Involve the linguistics experts in the OU? After all, in today's mass communications environment this is a skill which everyone needs.

An open question in both surveys was used to obtain suggestions from students on how they thought that LOs could be improved (in the modules sampled.) The results are shown in Table 10.

Table 10. The type of positive suggestions made by students.

Student suggestions	**Frequency**
Shorten sentences	8
Use bullet points	6
Simplify LOs in everyday terms *	5
Give an example of LO	4
Put key words in bold type	2
Change the font of key words or phrases	1
Change the colour of font for key words or phrases. **	1
Add the relevant LO to the beginning of an assessment / assignment question.	1
TOTAL	***28***

Notes

*One respondent made the point about "*wording for someone whose first language is not English".*

**This may also help students with dyslexia.

It was interesting to note that, when the results were analysed for positive and negative suggestions Survey 2 had more positive comments and fewer negative comments than Survey 1. Also, Survey 2 showed a lower percentage of students who thought that the LOs were OK as they were. This seemed to reinforce the suggestion above that the students who had completed modules were more used to using the technical language of LOs and were more critical of the LOs as they gained experience in their studies (remembering that these are Level 1 students).

Within both our surveys, we included similar questions, but in different formats, to test if student responses showed any variations e.g., we constructed Multiple Choice Questions (MCQs) using existing LOs from the modules studied in four different formats. We concluded that the main criticisms of sentence length, number of key words, amount of information, too generic, not student friendly and too vague were repeated in both surveys but that students were keen to suggest how these aspects could be improved. There was also a Ranking Question at the end of the survey to give students an opportunity to choose suggestions to improve the presentation of LOs in modules. The most popular in both surveys was a video explanation of the LO in the module resources with

someone explaining why they are important (particularly regarding future career prospects for engineering students), so this may increase students' engagement. There appear to be no video explanations of LOs in the modules being researched.

Implications

Student experience

As Associate Lecturers on T176 over several years we have noticed an element of frustration by students, mainly about LOs. This may partly account for the 'drop-out' rate on T176. By adopting some of the guidelines for LO design because of student feedback, retention may be improved.

Teaching

By presenting the findings of this project, we hope to influence the design of LOs and to raise awareness amongst ALs about the importance of LOs in their teaching.

Strategic change and learning design

It is interesting to note that OU Guidelines on LOs are available to design teams, but our research has shown (within the limits of the modules chosen) that these guidelines are not always followed.

Below are some guidelines for improving the design of Learning Outcomes based on the findings of this scholarship project. We conclude that, if these guidelines are followed, student engagement with Learning Outcomes will be improved.

Guidelines for improving student engagement with Learning Outcomes (LOs)

1. Including activities directly related to LOs in module resources and assessments or assignments seems to improve student engagement.
2. Presenting LOs as bullet points improves student engagement.
3. Short sentences improve LOs.
4. Only introduce one key word or phrase in a sentence e.g., instead of…

   "*Apply the knowledge and understanding skills to engineering problems, including application of numerical methods, and demonstrate an ability to describe the application of these ideas both mathematically and in writing"*

   …one long sentence; rewrite this as…

   "*You will be expected to use your knowledge of engineering topics to solve problems. You will also be expected to use your engineering skills such as mathematics to solve problems.*

   These solutions will need to be described in written English and in logical mathematical steps"

   …three short sentences.
5. Key words or phrases in bold type in an LO (possibly in a different colour to help students with dyslexia.).

6. Add the relevant LO to the beginning of an assignment, assessment, or activity to 'signpost' the importance of LOs to the student.
7. A 'Glossary of terms' used in LOs may be a useful support resource for students – especially those whose second language is English e.g., the difference between knowledge and understanding.
8. Use 'everyday language' wherever possible – especially at Level 1.
9. Examples of where LOs appear in module resources helps students understand LOs or a table of contents which includes where LOs appear in the module resources.
10. Video explanations of why LOs are important for future career progression may help in improving student engagement. Many students at Level 1 still have a long way to go in their studies before achieving their degree, let alone considering Chartered status. LOs are an important link with the UK-SPEC and this may not seem obvious at Level 1.

Deliverables

eSTEeM project reference :19F-AY-EI-01 Alan Yate - Do OU students understand the Learning Outcomes on courses in general and in T176, T192, T193, T194 in particular?

These still need to be generated e.g. LO support resources for students to be accessed via the OU Library.

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References

Biggs, J. & Tang, C. (2011), Teaching for Quality Learning at University: What the Student Does, Open University Press; 4th edition.

Brooks, S., Dobbins, K., Scott, J.A., Rawlinson, M., & Norman., R.I., (2014) Learning about learning outcomes: the student perspective, Teaching in Higher Education, 19:6, 721-733, DOI: 10.1080/13562517.2014.901964

Kinash, S. and Knight, D. (2013), Gold Coast, Queensland: Office of Learning and Teaching, Bond University. ISBN: 9781922183118. http://epublications.bond.edu.au/tls/61 https://pure.bond.edu.au/ws/portalfiles/portal/27949454/Assessment_Bond.pdf#page=27 (accessed 30.01.2020)

Kumpas-Lenkv, K., Eisenschmidt, E., Anneli Veispak, A., (2018) School of Educational Sciences, Tallinn University, Tallinn, Estonia. 'Does the design of learning outcomes matter from students' perspective?' Studies in Educational Evaluation, December 2018, Vol.59, pp.179-186.

Online Readability Testing:

(i) Webfx.con (Accessed July – October 2019)

(ii) Readbilityformulas.com (Accessed July – October 2019)

(iii) Online-utility.org (Accessed July – October 2019)

(iv) Prepostsco.com (Accessed July – October 2019)

University of Leicester Learning and Teaching website (Intended Learning Outcomes) https://www2.le.ac.uk/offices/lli/designing-your-course/curriculum-design/focused-course-design/intended-learning-outcomes

Yerushalmi, E., Henderson, C., Mamudi, W., Singh, C., Lin, S.; (2012) "The Group Administered Interactive Questionnaire: An Alternative to Individual Interviews"; AIP Conference Proceedings **1413**, 97 (2012).

University Approvals Processes

- *SRPP/SSPP –Application number 2019/104*
- *Ethical review –Reference number HREC/3356*
- *Data Protection Impact Assessment/Compliance Check – A Data Protection Impact Assessment/Compliance Check was obtained according to the Open University's code of practice and procedures before embarking on this project. Data Protection registration number XXXX*

Appendices

Appendix A

Table 11. The results of the computerised readability analysis of T176 Learning Outcomes 1 to 6.

Title of scoring index	**Website address and grade scores for readability tests**				
	Webfx.com	Readability formulas.com	Online-utility.org	Prepostsco.com	Average Scores
Flesch-Kincaid Reading Ease (1975)	29.1 (22.7) – Low readability	27.9 (22.7) – very difficult	20.15 (12.78)	16.5 (12.9)	23.4 (17.77)
Flesch-Kincaid Grade level (1975)	13.8 (15.2) Medium readability	13.7 (15.2)	14.92 (16.54)	17.2 (18.6)	14.9 (16.39)
Gunning Fog Score (1952)	17.3 (18.7) – Low readability	17.3 (18.7)	16.27 (17.77)	- (-)	16.8 (18.39)
SMOG Index (1969)	12.4 (13.4) – High readability	12.3 (13.4) – college level.	15.35 (16.53)	- (-)	13.3 (14.44)
Coleman Liau Index (1975)	17.1 (19.1) – Low readability	16.0 (17) – Graduate College.	15.96 (17.78)	18.6 (18.4)	16.9 (18.07)
Automated Readability Index (1967)	14.1 (16.7) – Medium readability	14.5 (-)	14.30 (16.80)	18.6 (20.2)	15.4 (17.9)
Average grade level (US) of all the readability tests = 16.8 +5 = 21.8 (22 years UK) (17.6 + 5 = 23.1 YRS UK)					
No. of sentences	12 (10)	(10)	(10)	8 (7)	10 (9.5)
No. of words	222 (204)	(204)	(204)	200 (200)	211 (203)
No. of complex words	55 (54)	(54)	(-)	- (-)	(54)
% of complex words	24.77% (26.4%)	(-)	(-)	- (-)	

Av. Words per sentence	18.50 (20.4)	(20)	(20.4)	48.8 (28.6)	33.6* (22.35)
Av. Syllables per word	1.88 (1.93)	(2 – Grade level 16 – very difficult to read)	(2.05) Improve sentence structure of LO3, LO4, LO5, LO6.	2 (2) Longest sentence is LO4.	(1.995)

NB – Figures in brackets are recalculated scores after adding full stops to subheadings and eliminating numbers and bullet points from the original LOs for T176.

As a rough guide US grade level 1 corresponds to ages 6–8. Reading level grade 8 corresponds to the typical reading level of a 14-year-old US child. Grade 12, the highest US secondary-school grade before college, corresponds to the reading level of a 17-year-old.

Appendix B

An example handout used in the student activity at Bath University (2019)

There were 5 groups of 4 students in two tutor groups (40 students) in this activity. Each group of 5 students had a different Learning Outcome from T176 to comment on. Space for students to comment on has been deleted.

STUDENT HANDOUT – LEARNING OUTCOME 1.

T176 - LEARNING OUTCOME 1

"Knowledge and understanding

1. Demonstrate knowledge and understanding of a topic in engineering by consideration of the underlying principles, concepts and motivations."

This worksheet is to find out what you think about the Learning Outcomes on T176 as part of a research project to help to improve the module content of T176.

Please write your comments on both sides. Thank you for your help,

Best wishes

Alan Yate and Steve Dutch (T176 tutors).

(i) Working on your own, write down what you think this statement means in the space below. Please read each key word carefully e.g., what is meant by 'demonstrate' ? Are there any words which do not make sense to you? Spend about 5 minutes on this.

(ii) Now discuss your answer with either a partner in your group or in groups of three and compare what each person wrote down. Make notes in the space below and spend about 5 minutes on this task:

(iii) After the discussion, rewrite in the space below how you think this Learning Outcome could be improved to make it easier to understand. Spend about 5 minutes on this task.

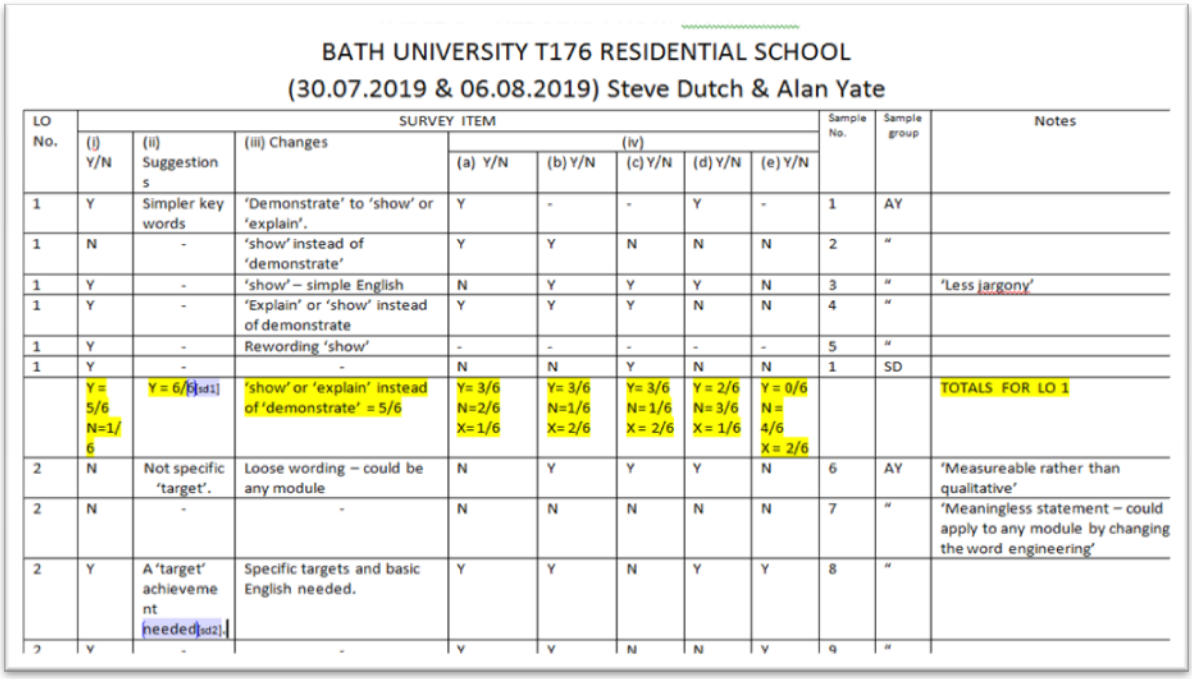
(iv) Now please write any comments in the space below which you feel might help students to understand what the Learning Outcomes mean to them in future versions of T176 e.g.

- Did you read the Learning Outcomes at the start of the course?
- Did you understand what they meant?
- Did you only read the Learning Outcomes when they appeared in the first TMA?
- Did you refer to the Learning outcomes after the first TMA?

Would you have bothered with the Learning Outcomes if they hadn't been included in a TMA? Please spend about 5 minutes on this task. Thank you.

Appendix C

Table 12. The results from the student activity at Bath University.



BATH UNIVERSITY T176 RESIDENTIAL SCHOOL

(30.07.2019 & 06.08.2019) Steve Dutch & Alan Yate

LO No.	SURVEY ITEM									Sample No.	Sample group	Notes
	(i) Y/N	(ii) Suggestions	(iii) Changes	(iv) (a) Y/N	(b) Y/N	(c) Y/N	(d) Y/N	(e) Y/N				
1	Y	Simpler key words	'Demonstrate' to 'show' or 'explain'.	Y	-	-	Y	-		1	AY	
1	N	-	'show' instead of 'demonstrate'	Y	Y	N	N	N		2	"	
1	Y	-	'show' – simple English	N	Y	Y	Y	N		3	"	'Less jargony'
1	Y	-	'Explain' or 'show' instead of demonstrate	Y	Y	Y	N	N		4	"	
1	Y	-	Rewording 'show'	-	-	-	-	-		5	"	
1	Y	-	-	N	N	Y	N	N		1	SD	
	Y = 5/6 N=1/6	Y = 6/6[sd1]	'show' or 'explain' instead of 'demonstrate' = 5/6	Y= 3/6 N=2/6 X=1/6	Y= 3/6 N=1/6 X= 2/6	Y= 3/6 N=1/6 X= 2/6	Y = 2/6 N= 3/6 X= 1/6	Y = 0/6 N = 4/6 X= 2/6				TOTALS FOR LO 1
2	N	Not specific 'target'.	Loose wording – could be any module	N	Y	Y	Y	N		6	AY	'Measureable rather than qualitative'
2	N	-	-	N	N	N	N	N		7	"	'Meaningless statement – could apply to any module by changing the word engineering'
2	Y	A 'target' achievement needed[sd2]	Specific targets and basic English needed.	Y	Y	N	Y	Y		8	"	
2	Y	-	-	Y	Y	N	N	Y		9	"	

2	Y	-	-	N	Y	Y	N	N	3	SD	
2	N	'struggled to express in own words'	-	N	Y	Y	N	N	1	"	
	Y = 3/6 N = 3/6	'TARGETS' NEEDED	WORDING NOT CLEAR	Y = 2/6 N = 4/6	Y = 5/6 N = 1/6	Y = 3/6 N = 3/6	Y = 2/6 N = 4/6	Y = 2/6 N = 4/6			TOTALS FOR LO 2
3[sd3]	Y	-	None needed	Y	N	N	Y	Y	10	AY	'LO's too vague'
3	N	-	'Didn't understand the question'	Y	N	Y	-	N	11	"	
3	Y	-	-	Y	Y	Y	Y	N	12	"	'partly' for (iv) a
3	Y	'easy to understand'	-	Y	Y	Y	N	N	13	"	(iv)b – 'some harder than others'
3	Y	-	-	Y	Y	N	N	Y	14	"	
3	Y	'Everyone had similar views'	-	N	Y	Y	N	N	4	SD	
3	Y	-	Not change anything	-	-	-	-	-	5	"	
3	Y	-	'Not broken don't fix'	N	Y	Y	N	Y	6	"	
3	Y	-	'Follow instructions' rather than 'interpret'	Y	Y	N	Y	N	7	"	
3	'partly'	-	'Use bullet points'	N	Y	Y	N	N	8	"	(ii) missed out 'published sources'
	Y= 9/10 N=1/10		'Follow instructions' rather than 'interpret' 'Use bullet points'	Y= 6/10 N = 3/10 X = 1/10	Y= 7/10 N = 3/10	Y= 6/10 N = 3/10 X = 1/10	Y = 3/10 N = 5/10 X = 2/10	Y = 3/10 N = 6/10 X = 1/10			TOTALS FOR LO 3
4[sd4]	Y	All similar	'Make the outcomes more	N	Y	Y	N	N	15	AY	

5	Y	'Examples of reports? Outdated material?'	'Activities on report writing. Shorter LO's?	-	-	-	-	-	17	"	
5	Y	Similar views.	Bullet points – shorter sentences.	Y	Y	-	N	-	18	"	
	Y= 6/7 N= 1/7	Similar views = 5/7	Bullet points – shorter sentences 3/7	Y = 4/7 N = 0/7 X = 3/7	Y = 3/7 N= 0/7 X = 4/7	Y = 0/7 N = 1/7 X = 6/7	Y = 0/7 N = 2/7 X = 5/7	Y = 0/7 N = 1/7 X = 6/7			TOTALS FOR LO 5

KEY

- Means not answered (X= no answer given.).

AY = Alan's group

SD = Steve's group

(iv) a – e for convenience of analysis the bullet points on the survey were replaced with letters.

TOTAL SAMPLE = 37 STUDENTS ON T176 RESIDENTIAL SCHOOL.

Note: Yellow highlighting shows the totals for Learning Outcomes 1 to 5.

Comments:

1. Activity (i) was coded as a simple Yes/No answer if it was judged that the student 'understood' the
2. LO in the description they made - so could be expressed as a percentage.
3. Activities (ii) and (iii) were coded as 'suggestions' (Question ii) and 'changes' (Question iii.)
4. Activity (iv) on the original handout only had bullet points for the 5 subsections. To code the responses to give some data which could be analysed, the bullet points were replaced by Sub-sections (a) – (e). This is how the responses appear in the results table .
5. The results for Activity (iv) were extracted and converted into percentages for each LO, using 'Yes' / 'No' / No answer (X) so that a comparison between the 5 LOs surveyed could be made. Please see Table 14.

Table 13. Percentages for responses to question (iv) parts a to e.

Item (iv)	**Percentage of Learning Outcome (LO) number (T176)**														
	LO1 (%)			**LO2 (%)**			**LO3 (%)**			**LO4 (%)**			**LO5 (%)**		
	Y	N	X	Y	N	X	Y	N	X	Y	N	X	Y	N	X
(a)	50	33.3	16.7	33.3	66.67	0.00	60	30	10	12.5	37.5	50	57	0.0	0 43
(b)	50	16.7	33.3	83.33	16.67	0.00	70	30	0.0	25	25	50	43	0.0	0 57
(c)	50	16.7	33.3	50	50	0.00	60	30	10	62.5	0.0	37.5	0.0	14.3	85.7
(d)	33.3	50	16.7	33.33	66.67	0.00	30	50	20	12.5	37.5	50	0.0	28.6	71.4
(e)	0.00	66.7	33.3	33.33	66.67	0.00	30	60	10	0.00	50	50	0.0		85.7

Key to item iv on student activity sheet

Y = Yes N = No X = Not answered

Items for activity (iv)

a) Did you read the Learning Outcomes at the start of the course?

b) Did you understand what they meant?

c) Did you only read the Learning Outcomes when they appeared in the first TMA?

d) Did you refer to the Learning outcomes after the first TMA?

e) Would you have bothered with the Learning Outcomes if they hadn't been included in a TMA?

Appendix D

Table 14. Comparing assignments where Learning Outcomes are directly mentioned in T176, T192, T193 and T194.

Module	**TMA01**	**TMA02**	**TMA03**	**Final Assessment**
T176	✓	✓	N/A	✓(EMA)
T192	X	X	N/A	✓(emTMA03)
T193	X	X	N/A	✓(EMA)
T194	X	X	X	X (CME81)

A.J.Yate 24.08.2021