Study of learning process and time used by students using a VLE/LMS while working on NATEF/ASE units

Abstract

ATT Training's virtual learning environment (VLE), also known as a learning management system (LMS), currently has some 4000 subscribers. A study was carried out to see how much time each user spent on particular aspects and therefore a figure was determined for how much learning time, on average, a student got from our system. The result was that each learning section, when used with the hard copy, questions and other interactive resources took an average time of about 110 minutes to complete. This result was derived from report log data collected by the VLE system (Moodle) over the period 2 January 2008 to 31 October 2008 (10 months).

The ATT material is usually used as a combination of instructor led learning and self-learning. Schools and Colleges tend to aim for 25% self-study. An instructor can easily find this percentage of self study from the online or DVD based learning material provided by ATT.

Introduction

A number of organizations that provide qualifications or certify a program, now require (or encourage) a percentage of the learning time to be done by self-study. They also require corroborated data about how long it takes students to complete eLearning tasks. An example organization is NATEF (see appendix 1). Of course some students will work faster than others and some will need more one-to-one support. This paper outlines a blended eLearning system provided by ATT Training and explains how an average figure for learning time was calculated.

ATT blended eLearning system

The ATT material includes comprehensive schemes of work that can be adapted to day attendance, full-time or block release as necessary. The system was developed and the content written by Tom Denton, a well-known automotive author (Denton, 2006).

The key aspects are that the content can be presented online, on standalone computers or be delivered by instructors in a classroom. For this report it is the online presentation that has been used to determine the time used/needed for study. It is further noted that 'teens' not only make good use of online learning material, they now expect it to be available. (Ito, 2009)

Access to online media is becoming universal. In the USA some 75% of households now have broadband access and 94% of 12 to 17 year olds regularly use the medium. 89% have access in their homes. (Lenhart, 2008)
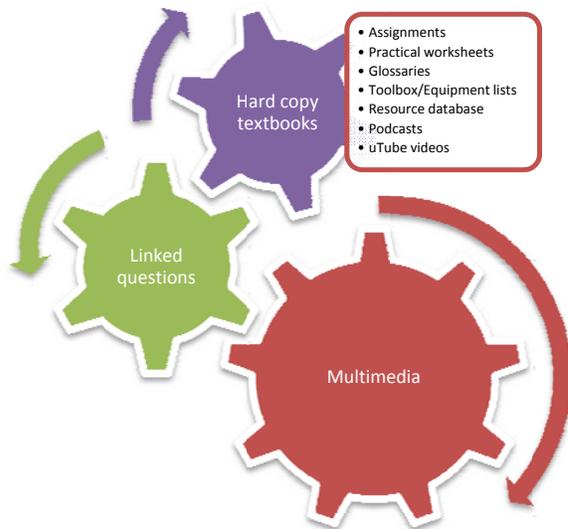
Figure 1. Representation of the blended approach

Heinze and Proctor describe blended learning as, *"…the effective combination of different modes of delivery, models of teaching and styles of learning."* (Heinze and Procter, 2007) In an earlier study they also added that it is, *"...founded on transparent communication amongst all parties involved with a course."* (Heinze and Procter, 2004) The ATT system follows this model in that a range of resources are combined to appeal to different teaching and learning styles.

The general approach to learning is a simple step-by-step method where the students build their knowledge on existing understanding, for example:

- What the student knows now
- Step 1
- Step 2
- Step n
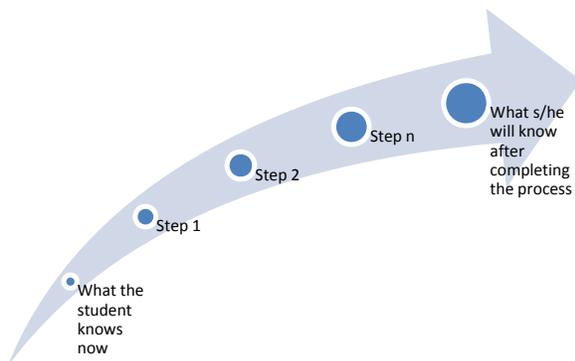- What s/he will know after completing the learning

Figure 2. Representation of knowledge development

Each of these steps, to some extent, involves a well-known learning cycle as follows (Kolb, 1984) when the material is used in the way it was intended:
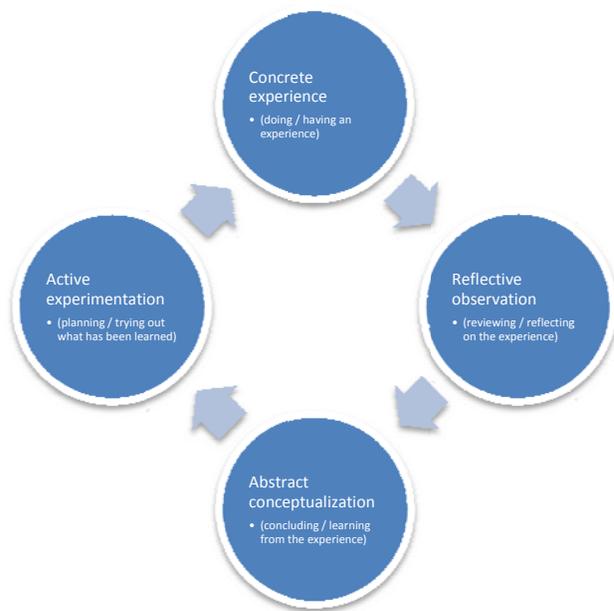
2

Figure 3. Kolb learning cycle

Overall, the ATT blended eLearning experience is engaging, fun and most importantly, effective.

Teaching and learning

Generic lesson plans are used in the ATT package to ensure a range of teaching and learning methods are employed. The methods range from classroom lectures, through supervised group work, to individual self-study. This variety and the blended learning approach will ensure that students receive instruction in a number of formats. No matter what their individual learning style, learning is ensured because of the variety of presentation methods. In addition, the methodology ensures that written, aural and kinaesthetic learners can all benefit.

In simple terms the following **five** key activities are carried out during a self-learning session as they complete each section of learning (guidance is provided for the students):

1. **Learning screens.** Each of the learning screens in the different sections of the unit is completed in order and this is done in combination with the hard copy version on which notes and diagram labels are added. Each screen is often replayed more than once as it is possible to interact with each screen, maybe by zooming in to look at important parts and/or scroll through the images or videos a number of times.

2. **Activities.** Short answer questions and other activities in the textbooks are completed by making reference back to the learning screens if needed.

3. **References.** Reference is made to other tools such as the glossaries, toolbox, blogs, forums and general information links.

4. **Summary points.** Summary bullet points are created in the hard copy books or these can be made electronically.

5. **Quizzes.** A multiple-choice quiz is completed. Feedback after incorrect answers guides the student back to relevant screens in the learning sections.

It is accepted that these five stages do to some extent simplify the actual process (Bull et al., 2008) but for purpose of determining an average time they are acceptable.

Methodology

To collect the data for the amount of time that a student actually spends working on the eLearning material, information was collated from 200 students. These students chosen had been accessing the learning content on ATT's Moodle VLE for just less than one year. The features of this system allow a teacher to check logs of the activities that students have undertaken. Appendix 2 shows a small sample of the data from just one student that was collated as part of the sample. Each row gives the time the student spent on one learning screen.

Similar data were collected for the time spent doing quizzes and taking part in other blended activities as noted on point 4 above.

The data were analyzed and an average time calculated for each activity. When combined with the numbers of screens, quizzes and other learning activities, an overall average time could be determined for each learning section.

Results of the study

The results of this research show that students, on average, spend the following times on learning the content of <u>each section</u>:

Table 1. Average activity times

Student actions	Average time (minutes)	Notes
Learning screens: 60 mins	60	Lengths of ATT sections vary but this is a good average
Activities: 15 mins	15	
References: 10 mins	10	Variable but a reasonable average
Summary points: 10 mins	10	
Quizzes: 15 mins	15	Quizzes usually relate to about 4 sections and are allocated 60 minutes
Totals	**110**	The number of sections in each unit vary

NATEF specify the minimum time that schools and colleges should spend on each unit as follows: "A program providing instruction in <u>all</u> of the automobile areas must have a minimum total of 1,080 hours of combined laboratory/shop (co-op) and classroom instruction. Tasks related to the eight automobile areas may be taught at different times during the course of study. Therefore, the hours for an individual area are the sum total of all the hours of instruction related to the tasks. Individual areas must have the following minimum hours:" (NATEF, 2008)

In this table the NATEF hours are specified together with the amount of self-learning material that is available from ATT as well as the recommended split between instructor led and student self learning.

Table 2. Summary results

Unit	NATEF Min.	ATT available[1]	ATT recommended self –learning [Hrs (%)][2]	Notes
Brakes	105	60	30 (29%)	
Electrical/Electronic Systems	230	150	60 (26%)	Smaller % of available as unit needs more instructor input
Engine Performance	220	150	60 (27%)	Ditto
Suspension & Steering	95	50	25 (26%)	
Automatic Transmission & Transaxle	125	65	35 (28%)	
Engine Repair	120	80	40 (33%)	
Heating & Air Conditioning	95	50	25 (26%)	
Manual Drive Train & Axles	90	50	25 (28%)	
Total hours	**1,080**	**655**	**345**	

Summary

The ATT material more than covers the recommendations made by NATEF and others. The average time that a student spends working on a section of blended eLearning is about 1 hour 50 minutes. This figure is based on a study of 200 students during 2009. This was used while completing five main stages of learning:

1. Learning screens
2. Activities
3. References
4. Summary points
5. Quizzes

The units studied contain many learning sections and results were presented relating to each unit together with recommendations for actual self-study time.

The ATT material is usually used as a combination of instructor-led learning and self-learning. Schools and Colleges tend to aim for about 25% self-study. An instructor can easily find this percentage of self study from the online or DVD based learning material provided by ATT.

Please visit: www.automotivett.com in order to preview a sample of our blended eLearning system.

Tom Denton, ATT Training, December 2009

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[1] If all the practical tasks supplied by ATT are carried out then the total recommended NATEF time is met or exceeded. In this table, just the theory/technology content is considered.
[2] The balance of self-learning to instructor led learning is a decision for instructors as they will make a judgement based on their knowledge of a particular class of students

Appendix 1

NATEF E-Learning Q & A   (from the NATEF website: www.natef.org on 10/2009)

Q - How does NATEF define e-learning in terms of program certification?

A - NATEF's definition of e-learning is: an electronically-based instructor-managed and student-driven process that enhances and/or supplements learning—outside the regularly scheduled classroom and lab/shop timeframe—and includes integrated and scored auditable assessment and reporting in compliance with NATEF's e-learning general framework criteria.

The definition is easier to understand when it is examined in smaller phrases. In other words, the instructor will determine the course content and each student will be responsible for learning the content. The course content must enhance and/or supplement the instruction delivered during regularly scheduled classroom and lab/shop instructional time. To meet NATEF's requirements, e-learning must take place outside of the classroom and lab/shop time (using a computer at home, public library, school computer lab, etc.). E-learning curricular materials must include tests to assess student knowledge and understanding of the content. E-learning instructional materials must incorporate an electronic Learning Management System (LMS) to track student progress and provide reports to the instructor.

Q – What is a Learning Management System (LMS)?

A – A LMS is an interactive electronic instructional delivery platform that also includes an administrative component to monitor and report student progress, time on task, and evaluations of all learning activities performed within the LMS.

Q – Can e-learning count toward meeting hour requirements for program certification in each content area?

A – Yes, as of July 2009, e-learning may be used in Automobile programs only. E-learning that is completed outside regularly scheduled program hours can count for up to 25 percent of the required hours in any of the automobile specialty program areas.

For example, up to 25 percent of the NATEF hour requirement in Brakes (26 of the 105 hours) could be delivered using e-learning instructional materials. This means that a minimum of 79 clock hours of actual class and lab/shop time must be included in the program's master schedule and up to 26 hours delivered using e-learning instructional materials outside of actual class and lab/shop time may be counted.

(NATEF anticipates that the General Service Technician (GST), Collision, and Truck programs will be added in the future.)

Q - Which tasks lend themselves to e-learning?

A – That's a good question and one that requires careful consideration on the part of the instructor(s). Instructors may find that e-learning may be most appropriate for the introduction of theory and demonstration of how to perform a task, similar to an instructor demonstrating performance of a task to students. Using e-learning instructional materials, some tasks may be introduced outside of regularly scheduled classroom time followed by additional information and/or 'hands-on' component (application) within the classroom and lab/shop time. Providers of e-learning instructional materials must identify an average or approximate time that is required to complete a learning activity. That said, many instructors say that one of the benefits of e-learning is that students are able to review the information as many times as necessary to learn the material.

Please keep in mind that the sophistication of the software may dictate, to some degree, the tasks that can be taught via e-learning. Additionally, the program advisory committee may be a valuable resource in determining the content of the instruction that could be taught via e-learning.

Q – How do we calculate the average time to complete an e-learning activity?

A - Software providers should establish the average time required to complete a learning activity as part of their instructional materials package. This should be based on a study of the actual time representative students take to complete a learning activity. This study should be reviewed occasionally for accuracy. The software provider must maintain documentation that indicates when and how the study was initially conducted as well as when any subsequent reviews or adjustments were performed. NATEF reserves the right to review this documentation.

Q – What kind of documentation must a program provide to the on-site team to use e-learning activities for program certification?

A – NATEF, with the assistance of subject matter experts, has developed a separate Standard 11 specifically for programs that use e-learning to meet the hour requirements for program certification. Standard 11 includes six criteria that require a Yes or No response. Programs must be able to document that they can achieve a 'YES' response for all six criteria before a program can apply the hours for program certification purposes. The six criteria are:

1. Is there documentation that students have access to appropriate technology for e-learning purposes?
2. Are the content/tasks and program hours that are to be delivered via e-learning clearly highlighted in the course of study?
3. Is there documentation that e-learning is incorporated into the content/tasks in the program plan?
4. Do the instructional hours to be credited toward meeting up to 25 percent of the program specialty hour requirements correlate with the software provider's average completion time for each instructional module?
5. Is there documentation of the implementation and use of e-learning instructional materials as evidenced in a learning management system?
6. Are Advisory Committee meeting minutes available to confirm that the committee has discussed and approved e-learning?

Q - If e-learning materials are used for the purpose of program certification, do all of the students have to participate?

A – Yes, e-learning is not a selective process, but must be available to all students enrolled in the program specialty area. Otherwise, some students may not have the opportunity to learn some of the course of study content in the tasks that are taught via e-learning.

Q - Can our school develop an e-learning system and how do we know if the e-learning process being used will be acceptable to the NATEF on-site evaluation team?

A – NATEF suggests that the criteria listed in Standard 11 be reviewed first. Have the program Advisory Committee discuss and endorse the e-learning process and record the Advisory Committee's endorsement in the meeting minutes. During the self-evaluation process, provide the documentation needed to answer the six Yes or No questions in Standard 11 – E-learning. If your program can provide the documentation to answer Yes to each of the six questions for e-learning activities that take place outside of classroom and lab/shop time, up to 25% of the hours (not tasks) required for certification may be applied in that area.

Q – We use e-learning curricular materials during classroom and lab/shop time, will that count for Standard 11?

A – No, time spent using e-learning curricular materials during classroom and lab/shop time may be counted as part of the regular program hours, but may not be applied to meet the requirements for Standard 11.

Appendix 2

Title	Status	Time
☐ Suspension Systems		
☐ 1 Reasons for suspension		
Introduction	Completed	03:37.8
Compromise	Completed	01:00.9
Sprung and Unsprung Mass	Completed	07:20.1
Learning Activity	Completed	02:44.4
Further In Suspension	Completed	02:49.7
Effect of Suspension	Completed	04:42.0
Springs	Completed	03:22.0
Learning Activity	Completed	02:02.8
Dampers or Shock Absorbers	Completed	04:57.0
Strut	Completed	05:59.0
Wishbone	Completed	05:10.0
Bump Stop	Completed	03:32.8
Link	Completed	01:17.4
Beam Axle	Completed	37:37.6
Gas/Fluid Suspension	Completed	02:05.2
Independent Suspension	Completed	06:37.7
Learning Activity	Completed	09:30.0
Anti-Roll Bar	Completed	02:30.2
Panhard Rod	Completed	08:17.4
Summary	Completed	03:32.0

The total time the student spent on this section of learning was: **58:45.9 minutes (rounded to 60!)**

References

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