CHAPTER 4

EVERYDAY STUDENT USE OF iPADS: A VADE MECUM FOR STUDENTS’ ACTIVE LEARNING

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Abstract

The iPad has evolved into a very capable computer with high processor power, enhanced screen resolution, and good battery life. However, this capability is still largely untapped in higher education by students or staff where there is still reliance on a Victorian higher educational system; that is, content delivery by lectures and assessment by examination. Massive Open Online Courses (MOOCs) are, mostly, a modernisation of such content delivery. However, active learning, coupled with increased availability of cloud services and iPads/smartphones, provides opportunities for students to use practical mobile devices anywhere. Such ubiquity allows tutors to promote active learning in any location, even in

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the lecture theatre. We examine some of the practicalities and pedagogy behind this trend and suggest ways in which students’ educational experiences are enhanced via active learning with iPads, whether cloud-linked or not. Involved, active learning promotes digital information and literacy skills into the curriculum as well as integrates knowledge bases via an *Internet of Everything*. Moreover, employability skills can be incorporated into the learning experiences and the personalisation of iPads can accommodate the needs of students with mobility and specific difficulties. Tutors seem reluctant to use iPads in educational environments. We expect this to diminish as students become empowered to use *smart-cloud* technologies to promote their educational needs. The iPad and its kin can be thought of as a *vade mecum*, enhancing everyone’s learning in a *fourth dimension* and can fit into modern pedagogies.

**Keywords:** active learning, higher education, iPad, pedagogy, vade mecum
Introduction

The iPad, and its imitator tablets, have come a long way since its introduction in Spring 2010. There are now more sizes, including the recent iPad Pro, with enhanced processor power and increased camera resolution and on-board sensors. This has been achieved with good (10 hours plus) battery life and screen resolution. As such, the iPad has now become a proper computer in its own right and some considerable way from the original (Steve Jobs’) concept of a media consumption device. Previous work has shown how capable these devices are, even in fieldwork with its various difficulties needing to be overcome, whether in a city or cold climate location. Our Enhancing Fieldwork Learning project directive has not been for technology’s sake, because something can be done with an iPad, but how these devices can fulfill educational roles within a suitable pedagogic framework. The problems are not entirely pedagogic, but rather concern enabling staff and students to use the technology appropriately for a variety of needs in higher education (HE).

In recent years several authors have suggested ways of improving education, or perhaps personalising higher education. McHaney (2011) suggested that Web 2.0 and Millennials were capable of revolutionising higher education and Thomas and Seeley Brown (2011) promote ways of cultivating the imagination for a world of constant change. Keri Facer (2011) in her “Learning Futures” examines “education, technology and social change” from a school as well as HE perspective. The issues of change are also encapsulated in identifying jobs for the future (Ross, 2016). To help guide educational practice within pedagogic frameworks we look towards the recent technological past and near future to suggest ways in which personalisation for diverse learning spaces can be provided. Some technologies of “flexible learning in a digital world” (Collis & Moonen, 2001) are now somewhat dated, although the educational principles still hold (Beetham & Sharpe, 2013).

In this paper we show how we have used the iPad so that it becomes a *vade mecum*, both a ready reference but also something, “regularly carried about by a person” (Merriam-Webster Dictionary). We liken an iPad to a version of Alan Kay’s DynaBook (Goldberg, 1979), Neal Stephenson’s “The Young Lady’s Illustrated Primer” (Brigg, 1999; Stephenson, 1995) or Douglas N. Adams’ “The Book” of the “Hitch Hiker’s Guide to the Galaxy” (Adams, 1996). An iPad, especially when coupled to the cloud, enables Wikipedia and its offspring to exceed any *Encyclopaedia Galactica* known so far. We suggest that iPads can also exceed most educational expectations of a personal laptop. This claim goes beyond
smalltalk so that a tablet, plus the user, allows the two to interact, with other people as well as information sources and sensors. In effect, the iPad allows education to be personalised to the needs of individual students and shared with other students and tutors as appropriate. Educationally, the iPad is a much more adaptable device than laptops, netbooks, or ultrabooks. In this paper we show some of the reasons for this contention.

In an insightful paper, Frand (2000) posed several questions about higher education in the “Information Age” and discussed “changes in students and implications for higher education.” He identified 10 attributes, “reflecting values and behaviors that make up what I call ‘the information-age mindset.’” For the most part, these attributes are true today and perhaps even more applicable with Wi-Fi, 3 and 4G and the cloud. Several quotations are apposite to situate our use of the new disruptive technologies to assist teaching and our implementation of these devices.

It’s not the “typing” but the power behind the “typing” that is so important today (p. 18) and

Where one works or studies—in the classroom, in the office, in the home, in a library, or on the road—will be determined by pedagogical, social, motivational, or biological factors, not by yesterday’s synchronous constraints.

and Frand concludes (p. 24) with,

The outlook of those we teach has changed, and thus the way in which we teach must change. The world in which we all live has changed, and thus the content we teach must change. The industrial age has become the information age, and thus the way we organize our institutions must change, as must the meaning we attach to the terms “student,” “teacher,” and “alumni.” The challenge will be for educators and higher education institutions to incorporate the information-age mindset of today’s learners into our programs so as to create communities of lifelong learners.

Practically and educationally, the iPad is a much more adaptable device than the laptops, netbooks or ultrabooks available when Frand was writing. In this paper we show some of the reasons for this contention by placing the device and its capabilities within a personalised system in what Jahnke and Norberg (2013) have called “Digital Didactical Design.”
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Using the iPad - Practice and Solutions

Given that we all live in an educational world, pedagogy or andragogy (Atherton, 2013) plays an important role in any teaching situation, whether by accident or design. Active learning has been brought into the information-computer-technology (ICT) domain (e.g., Beetham, 2013) although Miller (1990) had considered the general concept in medical education much earlier (Figure 4.1). Computer-assisted learning (CAL) of the 1970s has now given way to Technology Enhanced Learning (TEL). However, a problem for educators is getting the iPad into active TEL as a matter of routine. Despite much activity in using iPads in HE there are still concerns (Aiyegbayo, 2015) about their use. Similarly, despite the work showing that active breaks in lecturing help understanding (e.g., Freeman et al., 2014) there can be problems with acceptance of this lecturing mode (Waldrop, 2015). Can we bring together active education and the technologies of, and associated with, the iPad?

![Diagram](image)

*Figure 4.1. Miller's (1990) schema for assessment of medical student competences.*

The schema in Figure 4.1 suggests rather more active learning than the usual, somewhat passive, system of students attending lectures, taking notes, learning these for an examination or class test. This, usually referred to as shallow learning, is typical of Victorian education that has been transferred to the mass educational systems of the 21st century. Despite using technology, CAL mostly comes into this category, as do many MOOCs. This basic schema (Figure 4.1) can also apply to students doing...
fieldwork for example: a tutor moving between groups can evaluate progress in competences and provide feedback during fieldwork.

Fieldwork and Out-of-Classroom Activities

We have shown the use of iPads in fieldwork situations (France et al., 2015) and how it can promote group involvement and problem solving. Geist (2011) has made similar claims for the compulsory education sector. Such interventions are, generally, of active student involvement. We now progress from this stance to, if it works in the field it will work anywhere.

Table 4.1

Some Examples of Functionality of iPads for Several Senses, Individual Use, and Sharing (except social media and sensors)

<table>
<thead>
<tr>
<th>Sense</th>
<th>Mode</th>
<th>Tablet Functionality</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio, video</td>
<td>One to one,</td>
<td>Microphone, speaker</td>
<td>Phone, video chat, Skype</td>
</tr>
<tr>
<td></td>
<td>synchronous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio, video</td>
<td>One to one,</td>
<td>Microphone, speaker</td>
<td>Note-taking, podcast</td>
</tr>
<tr>
<td></td>
<td>asynchronous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Still images</td>
<td>Take, store,</td>
<td>Annotate, draw</td>
<td>Skitch</td>
</tr>
<tr>
<td></td>
<td>share</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field photo</td>
<td>Compare</td>
<td>Field identification app</td>
<td>Birdguide, TreeID</td>
</tr>
<tr>
<td>Text reading</td>
<td>One to one/</td>
<td>Download, share, distribute</td>
<td>e-books, PDF</td>
</tr>
<tr>
<td></td>
<td>many</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Text reading</td>
<td>One to one</td>
<td>Audio reading, recording</td>
<td>Siri, notebooks</td>
</tr>
<tr>
<td>Drawing</td>
<td>One to one</td>
<td>On screen</td>
<td>Field sketches</td>
</tr>
<tr>
<td>Position, location</td>
<td>One to one, synchronous</td>
<td>GPS recording</td>
<td>Field Trip GB etc.</td>
</tr>
</tbody>
</table>

In a recent survey of field practitioners using iPads in field teaching in the UK and abroad, we report a variety of uses of iPads and perceptions of use in the field (Welsh et al., 2015). Table 4.1 illustrates some ways that iPads can be used ubiquitously (see France et al., 2015 for a fuller range). For example, examining materials in the field, whether of rocks and fossils, plants and animals, means that it is mostly no longer necessary to take or remove samples from the field. Current fieldwork practices discourage collecting and indeed, for certain materials, whether animate or inanimate, collecting may be illegal. Photography with an iPad/iPhone
may obviate the need for collection. Most iPads can be fitted with simple and inexpensive supplementary lens systems that can act as field (Figure 4.2) or lab microscopes. These lenses are usually of surprisingly good quality. Images can immediately be placed in notebooks and tagged with GPS location and other site information and includes in an app designed for fieldwork.

Figure 4.2. Left, Using an iPad with a supplementary lens system to collect lichen data in Iceland. Right, Apple keyboard with magnified letter V key on the screen of an iPad mini via a supplementary lens. The imaging is done by the camera lens placed above the keyboard.

Other sensors, such as GPS, accelerometers to measure angles and compass directions, and the ability to use the iPad/iPhone as a luxmeter or seismometer may be important for fieldwork and collecting data as well as laboratory experiments. Additional external sensors can also be used for measuring wind speed and direction. The data collection and analysis is aided by specific apps for general use (e.g., Epicollect, FieldTripGB) or specialist use (e.g., Fieldmove for geology). As well as being used as field and laboratory notebook, apps can aid identification of trees, birds, insects, and stars. Other fieldwork uses can be found in France et al. (2015).

**Group Work and Citizen Science**

We have shown (Welsh et al., 2015) how the iPad can be used effectively in the field. Student fieldwork is often done in groups of 3-4 to facilitate sharing experiences, knowledge, or equipment. A single iPad can be a shared device for a group of students if individual ownership is not
available. Students may be recording data from a scientific instrument (Figure 4.2) or making observations of various kinds, as above, but including annotating photographs or making audio interviews and notes. The tablet does not have to be connected to the cloud in the field, although this may be desirable later. Even GPS availability, depending upon the iPad model, may not be necessary or could be added from an additional hand-held GPS or the assisted GPS functionality may be sufficient. Teamwork in research is enhanced by such collaboration as part of graduate attributes (France et al., 2013).

Using this diverse functionality, iPads have been used increasingly in citizen science or crowd-sourced projects. Groups may be very large and for sampling purposes, the larger the better, especially where areal coverage is needed. The raw data might be collected in the field and sent to specialists for processing. Examples are the surveys done by OPAL (www.opalexplorenature.org/opalobjectives) for the detection of various plant pathogens (e.g., leaf dieback, horse chestnut diseases), invasive species surveys (New Zealand flatworm) and heavy minerals. OPAL provides identification guides as well as on-line surveys. These are very much field-related but show that anybody can contribute.

A second form of citizen science is where the citizen examines or classifies a series of images, usually held externally. A well-known example is Galaxy Zoo, part of the Zooniverse project (www.zooniverse.org/). Even in 2013 several good apps could be identified (Malykhina, 2013) and the number increases steadily. Anyone can thus aid scientific endeavour and see what sampling, data, and statistics mean as part of a citizen science exploit. Mobile apps can easily be customised for student groups with crowdsourcing of data—good options are ODK, (opendatakit.org/Indicia, www.opalexplorenature.org /Indicia) and FieldTripGB, (fieldtripgb.blogs.edina.ac.uk), EpiCollect (www.epicollect.net), and Collector for ArcGIS (www.esri.com/ software/). Individual students and scientists can develop their own crowdsourced projects with the aid of CrowdFlower (www.crowdflower.com).
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Figure 4.3. An enhancement of the Sharpe and Beetham (2010) model adapted for use in a variety of practiced skills. A top level (Team development) has been added. The ‘levels’ are shown by dashed lines to suggest that the layers are not rigid.

Bringing these ideas together, of students as learners, students as researchers individually or contributing and sharing knowledge, we can extend Figure 4.1 to a more composite form as in Figure 4.3. We extend Miller’s triangle (Figure 4.1) to an n-sided pyramid where each facet represents a skill, practice, competence, or knowledge area. The base level of functional access (by an institution) is not a computer (of any kind) but rather Internet and Wi-Fi access to knowledge sources, etc. Students, and tutors, can communicate in formal class, practical lab sessions, or in the field and students, individually, or in groups, develop and practice these skills in context of the problem in hand (enquiry or problem-based learning or as peer learning). We have added a top tier to the original diagram (Sharpe & Beetham, 2010) that deals explicitly with teamwork and the soft skills of team development and employability.

Classroom Use of iPads

We can bring together our fieldwork experiences, the various uses to which iPads can be put in the field (Table 4.1), and extend their use to classroom and laboratory or seminar activities. In other words, the lecture theatre does not need to be a Victorian, downward-transmissive, mode of learning but can involve skills capability and development (Figure 4.3). The flipped classroom, Just-in-Time Teaching, and peer learning can all be
used, in whole or in part, to give active learning experiences to students. Furthermore, the iPad/iPhone offers a wide range of opportunities for promoting enquiry-led education. The active, enquiry-based, task might be the analysis of lab or field-collected data from their own or from other groups. The data could be identification, analysis of results, or statistical analysis. Data sets could be downloaded into smaller groups and worked on in the class. The processing power of iPads now allows, for example, **Python** or **MATLAB** (with Internet access) to be run and tasks set in the class can be solved in real time. The possibilities are perhaps only limited by the imagination of the tutor. Students may be in hospital. A Wi-Fi link could allow them to participate by **Skype/Facetime** or even **Twitter** messaging. Such participation would not be possible without iPad technologies. Not the least being that an iPad can be used sitting or lying in bed, even ‘ultramobiles’ have difficulties in providing such convenience and portability.

We now turn to suggesting some specific ways in which tutors and teachers can use iPads in learning situations. Most of these can be in the lecture theatre and indeed can be used to enhance the educational facilities for students. For example, the “peer learning” approach (Mazur, 1997) provides opportunities for small group learning even in a large formal lecture theatre. In such situations, students in 2–3 per group can discuss a problem posed by the tutor. Experience suggests that students are reluctant to call out answers, especially in large groups. Such reticence may be reduced by working in groups. Personal response systems (clickers) can be used in classes for multiple choice quizzes but generally have to be set up in advance. Apps such as **PollDaddy** allow quick surveys to be done using an iPad. However, Twitter and other social networking devices can be used as effectively in class. A hashtag grouping can be set up and students use this for their responses, sharing their responses (France et al. 2015).

**Bring Your Own Device (BYOD) and Technology (BYOT)**

The widespread uptake of smart tablet technologies, initially with iPhones and then with iPads has led to the possibilities of students (and tutors) using whatever device suits them. Although tablet sales appear to be levelling, data suggest that desktop sales will fall markedly in comparison (Gartner, 2015). Some students may need a desktop or laptop computer at home. However, neither of these computer types are pocketable and nor can they do the operations listed above (Table 4.1) with any ease in the field, library, lab, or classroom. We believe that tablet use by students will increase as they see their existing educational potential and for
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applications we do not yet suspect. Sharing data with a home-based computer, backing up notes via the cloud individually as well as with groups is the way the commercial world is progressing. In medical education its advantages have been well noted (e.g., Robertson et al., 2010) and as an interface the iPad allows data and statistical data to be shared (Park et al., 2014). We have already indicated the utility of iPads for fieldwork and personal learning environments (Whalley et al., 2015) and in a variety of formalities of learning (Grant, 2015).

![Diagram showing the main drivers of iPad BYOD for fieldwork cited by practitioners (n=33).]

We have been investigating the idea of Bring Your Own Device (BYOD) because of the widespread uptake of iPads and their utility in education. Some results are presented in Figure 4.4. There is a current educational debate about BYOD that mainly stems from costs to students and institutional restrictions and predilections rather than pedagogic objections. Digital technologies are enhancing education (e.g., Baron, 2009) rather than demoting it (Brabazon, 2002), although this is not a debate we wish to enter, other than noting the capabilities of students themselves (McHaney, 2011). Our concern is to show tutors that personal digital technologies can be used to everyone’s advantage. The continuing
use of iPads and iPhones by students will undoubtedly promote their use in all forms of education as an adjunct to social use. Tutors may have to accept that there may need to be changes in their pedagogic approaches to higher education.

**Internet of Knowledge and Personal Learning**

The *Internet of Things* (IoT) is a term relating to the networking of a wide variety of objects to collect and exchange data. IoT was originally introduced by Kevin Ashton in 1999 ([en.wikipedia.org/wiki/Internet_of_Things](en.wikipedia.org/wiki/Internet_of_Things)). It can be illustrated by Figure 4.5 in which overlaps between various interactions can be identified on a time-line. Although these identified areas have fuzzy boundaries we might see events achieved even earlier than indicated. Tablet technologies can assist communication in any of these domains.

The iPad is, in effect, a *force multiplier*. As in the military context, iPads enable the user to achieve far more with than without it. It is not necessary to have a paper and pencil to record notes or a separate camera and microscope to take, record, annotate, and distribute photographic data. Additionally, metadata, written, image, or audio, can be added to images and shared and searched. The iPad is essentially a pocket-sized computer than can extend the education of any student or group (Figure 4.6).

**Use Your Own Device - iPads as a Vade Mecum**

Although our BYOD findings perhaps suggest a neutral attitude of tutors to iPads, we feel that this will change by virtue of students’ use of tablets. If they can see the benefits of iPads, beyond the realm of music and videos, tablets provide a means of extending their education wherever they happen to be. The problem seems to be to get tutors to see iPad used in a general sense, of utility for many different purposes. Thus, for example, if students learn to use iPads to promote citizen science as a member of the public, then this familiarity can be exploited as necessary by tutors.

One of the problems of having an institutional provision of iPads of even modest numbers means that not only there is a high initial cost but that models go out of date. Furthermore, if institutional control is required then all sorts of problems may arise, with local rules as well as any software inadequacies. Some of the general pitfalls of BYOD have been noted elsewhere (e.g., The Inquirer, 2014).
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Figure 4.5. A project ‘road map’ of the Internet of Things (Source, Wikipedia, en.wikipedia.org/wiki/Internet_of_Things).

Figure 4.6. Illustration of intersecting elements that make the iPad a force multiplier for learning.
Figure 4.7. Pedagogic attributes centred on the iPad with spheres of influence of connectivity (as circles). Modified after Jahnke & Norberg (2013).

Figure 4.7 places the iPad in the center of an educational system associated with pedagogy (triangle) and social and device interconnectivity through the Internet of Things.

The Vade Mecum in the Fourth Dimension

We suggest that the iPad is part of a continuum of integrated devices that are able to communicate with other groups and individuals, plus the cloud, that is needed at any location and at any time (Figure 4.5). What apps and devices are used to obtain, record, and transfer information depends upon circumstances. Truly portable ICT technology arrived with the pocketable iPhone and continues with the iPad in various sizes, Apple Watch, and the Occulus Rift. This applies to most things, the Internet of Things for those living in a digital world (Figure 4.6) whether we refer to education or not. Higher Education is only one, formalised, part of education. Much of higher education and education in general is part of what Scott has termed (his version of) the ‘fourth dimension’ (Scott, 2015), in essence, the internet of everything. A vade mecum (Latin: I go + with me = go with me) was originally a book, a handbook or manual that was useful. Wikipedia suggests, “A handbook is a treatise on a special subject. Nowadays it is often a simple but all-embracing treatment, containing concise information and being small enough to be held in the hand.” We
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think this definition fits an iPad/iPhone very well in its own right and exceptionally so when we link it with the cloud. Connectivity in the IoT extends this functionality and the user+iPad to approach Stephenson’s (1995) “Young Lady’s Illustrated Primer.”

Into this educational mix, the MOOC has been added. In effect however, this is a recent, more flexible version of the way the UK’s Open University originally operated, with radio and TV broadcasts. The video recorder was a means of bringing the education recourse from late night transmission to viewing when convenient. This leads to on-demand education, either formal, university-led MOOCs, informal, such as YouTube or semi-formal, such as iTunes U and podcasts. The vade mecum (or one of its component parts such as an iPhone) is merely a way of interacting with this complex as appropriate. It allows a measure of active learning as required. In this we have the various types of MOOCs (see degreeoffreedom.org/xmooc-vs-cmooc) and a consideration of whether these are mere distance learning opportunities in a network of individuals leading to information sources. Cormier (2008) has used the concept of “rhyzomatic education” to envisage a better way of leaning, although Siemens writes:

I don’t see rhizomes as possessing a similar capacity (to networks) to generate insight into learning, innovation, and complexity... Rhizomes then, are effective for describing the structure and form of knowledge and learning...[h]owever, beyond the value of describing the form of curriculum as decentralized, adaptive, and organic, I’m unsure what rhizomes contribute to knowledge and learning. (Siemens at en.wikipedia.org/wiki/Rhizomatic_Learning)

Perhaps both network and rhizome analogies are misleading. In most vascular plants, water-soluble plant nutrients are taken in, not via roots or root hairs, but by the symbiotic/mutualistic influence of fungal bodies that link the plant to the soil water. Selective adsorption and weathering occurs at the interface of the mycorrhizal system and minerals. (See, en.wikipedia.org/wiki/Mycorrhiza for a brief description.) The plant metabolism is achieved by the mycorrhizae not the plant structure itself. Similarly, active education depends on how the learner interacts (or metabolizes) with structures in the digital world (Figure 4.6). Returning to our Victorian educational system, the student sitting in a lecture takes information, perhaps reprocesses it and writes an essay. A student with a vade mecum now can interact with colleagues from a hospital bed or bus as well as in the lecture theatre. Maybe a pencil and paper will suffice but all the iPad functionality (Table 4.1) can make the educational experience,
at the very least, less passive. The *vade mecum* thus becomes a natural part of the TEL metabolic system without actually worrying about the technology. The iPad’s ease of use has essentially banished computer/technophobia so to achieve better educational possibilities.

**TV, Radio, and the Internet**

One of Frand’s (2000) 10 attributes was, “Internet better than TV” giving rise to the statement:

> One preliminary finding is that during 1998, for the first time since television was introduced fifty years ago, the number of hours young people spent watching TV decreased. This time was transferred to the computer, with its Internet connectivity. Cole believes it’s the interactivity that has drawn them from one tube to the other.

The sociological concern with first 10 years’ hindsight is that many young people now spent time closeted in their rooms with black boxes. In the meantime the TV set, thanks to Internet connectivity, can *time shift* and even *place-shift* (as in Slingbox). Even the humble radio can *format shift* to allow podcasts of recorded programmes. All these digital entities, “information as thing” (Buckland, 1991), can be used to promote better, more adaptable educational devices.

**Conclusions**

Although the iPad is widely seen as an important device for education across the spectrum from nursery school to university, there still seems to be a reluctance to consider it as a meaningful device for students to purchase. Some (e.g., Hahn & Bussell, 2012) have suggested the use by students in libraries rather than for a general applicability. Our research shows that students are willing to use iPads, especially when they are shown the educational advantages. Nevertheless, there is, as yet, also a reluctance to buy their own device. This is understandable on cost grounds. However, there was never, as far as we know, a directive that students had to have their own computers, desktop or laptop. We believe that most students in HE can make best use of an iPad as their main, even only, device (in addition to an iPhone perhaps).

We have argued that any iPad is, or rather can be, a *vade mecum*, something you take with you anywhere. It can contain (or be able to contain via download) the information you want, or need, where the just-in-time need is governed by the task in hand. It is up to the tutor to fit
teaching modes into class use. Active learning, enquiry-based learning, problem-based learning, competency-based and outcomes-based education (Rajaee et al., 2013) can all be enhanced in this mode.

There are implications for libraries in institutions and the institutions themselves. Some institutions have supplied multiple iPads for use by students. A variety of schemes is available but most tend to suffer from built-in obsolescence as new models with higher specifications become available. We do not know if this trend will continue or, more likely, BYOD will become commonplace. It is then incumbent upon tutors, and their institutions, to avail such facilities and their base-line Wi-Fi and infrastructure (Figures 4.3 and 4.6). These educational interventions fit in with Hattie and Yates’ “Visible Learning” (2014) and are closely allied to practical engagement via individual, peer and group-based problem-solving approaches.
References


