LEARNING and the E-GENERATION

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Learning and the E-Generation

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Foreword

We envisaged this sequel to *Computers and learning: Helping children acquire thinking skills* (Underwood & Underwood, 1990) would appear as a belated millennium offering but work pressures and the rapidity of change in this field caused us first to delay and then to rethink roles. Those pressures led to Geoff Underwood stepping aside while a new co-author joined me in completing the text. I would like to thank Geoff for his generosity and Lee for his hard work in producing this text for Wiley.

We would like to thank the many Blackwell's production staff associated with this project for their tireless support and patience. At times they must have despaired of ever seeing a completed manuscript.

Much of our own work reported here emanates from a very fruitful and long-standing association with BECTA and there are many of the staff of that now lost champion of digital learning we could and should thank. Please forgive us if we name just three: Peter Avis, Di Levine and Vanessa Pittard have always acted more as partners than sponsors of our research.

Several teams of researchers contributed to studies reported in this text. Central to those teams have been: Alison Ault, Thom Baguley, Phil Banyard, Sue Cavendish, Emily Coyne, Gayle Dillon, Mary Hayes, Tony Lawson, Ian Selwood, Bridget Somekh, James Stiller and Peter Twining. Firstly Sue, then Gayle and Phil, have been rocks on which much of this work has been built.

Finally, thank you to the many children, teachers and schools that allowed us access and gave their time to help

identify how and why technology can contribute to effective teaching and learning.

Chapter One
Learning in a Digital World

Starting Points

It is two decades since *Computers and learning: Helping children acquire thinking skills* was published (Underwood & Underwood, 1990). This sequel text is entitled *Learning and the e-generation* as a recognition that the digital contexts in which individuals now learn has irrevocably changed. The new generation of students, for whom digital technologies are the norm, has grown up during the rise of the World Wide Web and uses technology at home and in school for learning and entertainment. Their use of digital media is expanding and their culture will have a major impact on the rest of society. They now use online resources as a preferred option and as a consequence headlines such as ‘Libraries dump 2m volumes’ (Atwood, 2007, p. 1) mark the move from paper to digital technology storage and the demand from students for more space for virtual-learning study areas. It is not that the students have abandoned libraries; they are simply reshaping their use. Video game playing, for example, has taught them to place less reliance on manuals or experts. Students use Google rather than use the library’s web pages: they are used to figuring things out for themselves and their reliance on the expert, in this case the librarian, is diminishing (Lippincott, 2005). Outside the classroom, everyday events such as paying the London congestion charge or finding the time of the next bus are facilitated by a savvy use of technology.

In 1990 we noted that classroom computers were now commonplace and we asked the question would any good come of it? We were cautiously confident of the value of

educational computers. Has that state of restrained optimism changed and, 20 years on, is there reliable evidence of the impact of computer use on the cognitive, and indeed social and emotional development of the learner? There is compelling evidence that technology is changing the lives of many children and young adults in ways that we had not originally anticipated. With the rise in Web 2.0 technologies and new social media, learners have greater access to a range of digital tools for collaborating, communicating and exchanging ideas. Learners can share common interests, photos, music and videos and maintain active social relationships with friends, acquaintances and even strangers through a range of online communication tools. Facebook along with other social networking tools such as YouTube (video sharing), Flickr (photo sharing) and Blogger (interactive online diary) are incredibly popular among many learners and this popularity reflects a shift towards acquiring a range of new digital literacy skills beyond those of simply using a traditional computer. Technology is also being used in quite creative and innovative ways, invading every aspect of our lives, as Palmer acknowledges below:

> It is only in the last couple of decades that electronic speed has overtaken real time, as technology has invaded every aspect of our life and work. PCs, the Internet, the web and mobile phones mean that the (Marshal McLuhan's) electronic (global) village is around us 24/7, whether we like it or not.
>
> (Palmer, 2006, p. 253)

It seems that we are now part of this extensive, global electronic village that shapes every aspect of our social lives. However, the rise in Web 2.0 technologies and the affordances of digital tools now challenges the relevance of our initial question. The digital world is here to stay and

even if we decide not to fund resources into schools, as some are arguing should be the policy, the net generation will use the technology from home, in the streets and in every other aspect of the lives. The current generation of students is able to work with technologies in ways not thought of by even their elder siblings. The Test Bed project has shown children as young as 5 years of age happily working with digital cameras and editing photos to produce their own web pages, while in the secondary sector students are producing home movies and composing and recording music (Underwood, Dillon & Twining, 2007). Furthermore, communication has been transformed through the Internet. It is estimated that there are in excess of 27.2 million weblogs and the blogosphere continues to double about every 5.5 months. There are about 75,000 new weblogs created every day and 1.2 million posts per day on average (Sifry, 2006). These creative activities are not just for home or school consumption, the audience is now worldwide using YouTube or GoogleVideo for videos or Myspace, Facebook or Bebo to link to friends. As Green and Hannon (2007) point out these students are connecting, exchanging and creating in new ways, which appear quite unfamiliar to many parents and teachers (Banyard, Underwood, & Twiner, 2006).

So the question now is how do we make the best use of these digital technologies? There are many who would argue that the functions offered by Web 2.0 technologies have the potential to offer increased learning opportunities for students and young adults (see, for example, Bennett, Bishop, Dalgano, Waycott, & Kennedy, 2012; Contarello & Sarrica, 2007). Can we identify the ‘what’ and the ‘how’ of the impact that the major advances in and increased accesses to digital technologies are having on the development of the net generation? A second equally

important question is can we identify and support those who have not yet joined the net generation? Throughout our own research (Underwood, Baguley, et al., 2007, 2009) there has been a persistent minority of some 10 per cent of students who have minimal access to computers and the Internet outside school, a finding confirmed by Madell and Muncer's (2004) survey of 1,340 11-to-16 year olds in the north of England, which showed a large proportion of students simply did not have access to new digital technologies. These findings highlight the equity issues associated with the use of digital technologies for learning. Although cheap technologies such as the Raspberry Pi[1] and the £30 UbiSlate 7Ci tablet[2], which have recently entered the educational marketplace, is suspected to go some way to alleviating the issue of access, there are still a minority of individuals for whom this technology is unavailable.

There is little doubt that the prolific rise in our access to digital technologies is having a marked effect on how we learn and think. Johnson (2005) asserts that popular culture, to a large extent stimulated by rapid developments in digital technologies, has presented us with an increasingly complex, problem-orientated and intellectually challenging world. This is the antithesis of the 'couch-potato' perspective of the impact on the cultures evoked by digital technologies. Johnson's book, *Everything bad is good for you*, has reinvigorated and redirected the debate on the impact of technology in a way reminiscent of Papert's (1980) *Mindstorms: Children, computers and powerful ideas*. However, surprisingly three decades after the first computers were introduced into mainstream classrooms, the educational use of digital technologies still remains controversial. As with the introduction of earlier technologies, the spread of digital technologies, especially the Internet, arouses passionate debate about the consequences ensuing from technological change and

innovation (Marvin, 1988; Southwell & Doyle, 2004). As Underwood (2006) points out the digital world is now an everyday reality but does this new reality bring benefits or costs to education? Is this too simplistic a dichotomy and, as Southwell and Doyle have argued, can both divergent positions be simultaneously correct? Here we investigate the challenge of digital technologies on learner behaviours across both formal and informal settings.

Hopes, Dreams and Nightmares

There are many who question the importance of digital technologies for education (see Selwyn, 2006; Underwood & Dillon, 2004, for a fuller debate) and vociferous arguments have been put forward to support the conclusion that, far from enhancing education, ICT is a drain on our educational system (see Cuban, 2001; Cuban, Kirkpatrick, & Peck, 2001; Oppenheimer, 2003). This perception clearly articulated in the title of Oppenheimer's text, *The flickering mind: The false promise of technology in the classroom and how learning can be saved*. Notwithstanding this doom-laden title, Oppenheimer acknowledges, 'Computers can, in select cases, be wonderfully useful to school' (p. 411). For instance, the effectiveness of technology in supporting students with special educational needs is accepted by most. This is exemplified by work such as that of Standen and Brown (2005), which has shown the benefits of virtual reality as a tool to practise skills needed to function in society. These vulnerable students manipulated a virtual world safely, without being exposed to potentially humiliating or dangerous consequences, thus allowing them to develop skills such as grocery shopping, preparing food, orientation, road safety and manufacturing skills before facing a bewildering, and for some threatening, real world.

The aim of this learning experience was to facilitate independence by transferring skills acquired virtually to the real world. Parsons and Mitchell (2002) have similar positive findings from virtual reality training of social skills with adults on the autism spectrum. The use of technology also allows those with special educational needs to demonstrate competencies thought to be beyond them. For example, young children on the autistic spectrum can match those skills of their typically developing peers on imaginative storytelling under the right circumstances and situations (Dillon & Underwood, 2012).

While recognizing the benefits of such experiences for special groups Oppenheimer nevertheless adds the caveat that 'high technology is steering youngsters away from the messy fundamental challenges of the real world … toward the hurried buzz and neat convenience of an unreal virtual world' (2003, p. 411). It is Oppenheimer's reasonableness that makes him such a powerful critic of the value of technology as a learning tool. His scepticism raised three key questions:

1. Can digital technologies enhance the cognitive, social and emotional development of the learner?
2. Which learners benefit and under what circumstances do they benefit?
3. Are there losers: students for whom technology is at best an irrelevance but possibly a hindrance to their development?

For many working in the field there is a growing acceptance that, as Southwell and Doyle (2004) have argued, the answer cannot be a simple yes or no. Debates concerning the educational value of technology rage on. On the one hand Johnson (2005) asserts that popular culture alludes to the issue that new digital technologies are mind

enhancing, that is technology makes smart kids; while Hancox (2005) warns that the rising number of ‘couch potatoes’, a consequence of the popularity of entertainment technologies, is fuelling the obesity epidemic in the Western world. Central to this debate is the argument that digital technologies are actually damaging and eroding young people’s social lives (Palmer, 2006). For example, in the affective domain, there is a growing body of research evidencing the deleterious effects of video game playing on the socio-emotional development of adolescents. There are also genuine concerns of some parties that computer games are even dangerous and damaging to young people’s intellectual and social capabilities (Guan & Subrahmanyam, 2009).

Why Is the Supportive Evidence so Hard to Find?

So with the potential for new digital technologies to revolutionize both learning and education, why is the evidence so hard to find? In our review of the research on Integrated Learning Systems (ILSs) in UK schools a decade ago, we made the following argument:

> we need, but do not currently possess, a well-founded ‘language’ which we can use to classify, relate and communicate about the different kinds of tasks we use to assess learning, so that we can refine our claims about the impact of teaching and learning outcomes and our assessment of what a learning gain means.
>
> (Wood, Underwood, & Avis, 1999, p. 99)

Although many teachers and students in the UK ILS evaluation, as well as other similar international studies, recorded strong positive attitudinal and motivational changes to learning (Hativa, 1989) and a strong belief that

learning gains were substantial (Barrett & Underwood, 1997), there was no evidence of ILSs conferring benefits on the standard indices of school and student achievement such as SATs or GCSE scores. This clear discrepancy between hard outcome measures and the experiences of teachers and students led us to re-evaluate both the questions we were asking and the methods by which we were seeking to capture educational experiences (Underwood & Dillon, 2004). A partial explanation for the discrepancies exemplified by the ILS evaluation is that we were measuring the wrong thing.

A brief aside, as we finalize this manuscript the headline news is that the government is looking once again to computers to teach children. Under the disparaging headline '4 reasons to be happy about the end of teaching', Harriet Green (2013)[3] reports that the Minister for Skills and Enterprise, Matthew Hancock, has plans to use computers and personalized online tuition to impart knowledge. Green posits four reasons why the technology will deliver, of which the need to help teachers combat large class sizes seems the most important. Interestingly she reports that the Minister feels this approach will free teachers' time in the classroom to focus more on mentoring, coaching and improving the motivation of learners. When ILSs were first mooted in the 1980s they were seen as a cost-efficient way to reduce teaching staff and, if Hancock is true to his word, the current government's view is that personalized systems will reduce the workload of teachers allowing them to function in more meaningful ways. Of course, the counter argument is simply to employ a higher proportion of teachers although this seems an unlikely route for any government to take in the near future. What we do know, however, is that headlines such 'League Tables 2013: Hundreds of schools below new targets'[4] put a very real pressure on both the

government and the educational professionals to up their game and deliver.

While the usefulness of digital technologies in education is an open debate, few would challenge the major impact of digital technologies on our everyday lives. The iSociety's report on the impact of increasing bandwidth into the home, schools and the workplace exemplifies this impact (Crabtree & Roberts, 2003). Their report identifies the ways in which people use technology to extend and enhance their everyday lives, arguing that this information is 'the basis for any sensible understanding of technological change' (Crabtree & Roberts, p. 3). They too say that positive impacts of technology in the world outside the classroom are elusive but point to proof by existence as one way forward. They point out that it is difficult to capture the economic gains using standard metrics of digital technologies on say a small business such as a local painter, yet every painter and plumber is now an active user of the mobile phone. There is the existence proof of the importance of technology, which Crabtree and Roberts argue is a valid affirmation of the effectiveness of the technology.

Children's interactions with digital texts in out-of-school settings have revealed the playfulness, agency and creativity with which the children engage with the technology (Burnett, 2010). For example, Marsh's (2004) study of the literacy practices of pre-school children in the home found that engagement with television, computer games and mobile phones provided the children with pleasure and self-expression.

> Literacy as skills development was embedded within children's techno-literacy practices, whether that related to learning grapheme/phoneme relationships from watching television or reading texts on the screens of computer games. In short, children's home literacy events within this study could be mapped on to existing literature in the field, differing only in the extent to which techno-literacy practices were involved.
>
> (Marsh, 2004, p. 63)

There is also a growing recognition that technology can shift the goals of education. One example would be how the use of calculators has shifted the focus of mathematics towards estimation and the meaning of operations and away from the mechanics of the arithmetic operations themselves. Or a more current change in the way texting on mobile phones is allowing new forms of written communication to evolve among our digital natives (Baron, 2010). Where generations of well-meaning spelling reform have failed to introduce simplified spellings, mobile phone texts have succeeded admirably.

It remains clear that merely adding digital technology into the classroom is unlikely to produce any notable improvements in either the quality of teaching or the outcome of students' learning. We are also aware that for some teachers there is a lack of necessary knowledge or experience to successfully incorporate such new technologies into their own teaching practices (Underwood, Baguley, et al., 2010). The association between affordances of the technologies and learner-engagement is key to understanding what works, what does not and why. Furthermore, within education there is a need to go beyond simply understanding technological change, important though this is, to understanding the impact of such change on the actual processes of learning. It is also important to

recognize that much learning takes place outside formal settings. One of the very real impacts of digital technologies is that much of the learning process may be taken out of the formal arena and into less formal contexts, although the extent to which this may become the norm is not part of the discussion here. However, by identifying the active use of digital technologies in both formal and informal learning environments, as Crabtree and Roberts (2003) suggest, represents only the first stage in realizing the true potential of digital technology for educational learning.

The impact of digital technologies on the process and products of education have proved difficult to assess for a number of reasons but, as Eisenhart (2005) asserts, the search for causation is a fixation as we seek to establish the events and processes that will promote an effective educational system. In brief, education is a complex system of interrelationships of checks and balances and we neglect this inherent complexity at our peril for such neglect will not facilitate an in-depth understanding of this reality.

Contextual factors do not provide a neutral backcloth on which the teaching and learning are played out. These factors may in turn hinder or help the task of embedding any innovation into the educational environment. These influencing factors include learner variables such prior knowledge but also investment in learning (Underwood, Baguley, et al., 2007) and organizational structures put in place by the school. Some are directly influential at the learner level, and these include elements of the home and community environments. While factors such as national and local policies do have a secondary impact and often influence the behaviour of teachers and the policies of schools, they often fail to impact the individual learner directly.

In addition, it is clear that technological innovations are rarely a direct cause of change but rather act to facilitate existing educational practices. It is clear such evidence is beginning to emerge especially within the findings of Impact studies that have been carried out within the United Kingdom (Underwood, Ault, et al., 2006; Underwood, Baguley, et al., 2007, 2010). While much thoughtful and illuminating research has been conducted into the impact of ICT on education, the story so far is confused and confusing. To capture a greater proportion of this complexity, a necessary prerequisite for the development of predictive dynamic models of the impact of ICT on the educational process, we first need to develop analytical tools, which allow the synthesis of multiple-sourced data. Knowing how these factors interact with one another is important and worthy of our research endeavours.

Evidence of effectiveness in the ordinary classroom is what has been questioned. While a body of anecdotal evidence or existence proof ('I've seen it with my own eyes') has been available for some time, what one might term hard evidence has been patchy at best. However, evidence of effect is beginning to emerge, for example, from the large-scale four-year Test Bed project, which was an investigation of how the sustained and embedded use of ICT in learning spaces can improve learner outcomes, classroom practice and institutional development (Underwood, Dillon, & Twining, 2007). Schools within this project were provided with funds to upgrade their technical resources and to train staff in the use of those resources. One of the key findings from the final phase of this project was the confirmation of the existence of, and recovery from, the previously reported technology dip (Underwood & Dillon, 2011). The research has also shown that the post-dip recovery can be swift and strong as staff ICT competence and confidence rose in the year after the

technology was introduced. This in turn was followed by an expansion of staff pedagogic skills in year three, finally leading to verifiable gains in core national test scores in year four of the project (Underwood & Dillon, 2004). This successful incorporation of technology was achieved over a four-year period and through the development of the staff and student skills base, which in turn was stimulated by good school leadership. The findings from this innovative project showed that technology alone is not that effective but effective use of technology does reap dividends. Therefore, while recognizing the importance of changing educational structures, it is vital to recognize that the interaction of teachers and learners with technology remains pivotal and it is here that psychology has important contributions to make to the debate about effective learning.

As Green and Hannon suggest, the fact that our current generation of students are able to work with technologies in ways unthought of by adults, is indicative that they are on the other side of a digital divide:

> The current generations of decision-makers – from politicians to teachers – see the world from a very different perspective to the generation of young people who do not remember life without the instant answers of the Internet or the immediate communication of mobile phones.
>
> (Green & Hannon, 2007, p. 15)

The term ‘digital divide’ became part of the *lingua franca* in the 1990s but the early economic definition of that time is now seen as simplistic and has given way to a rich and complex concept of interacting physical, digital, human and social resources (for a description of the ontogeny of this concept, see Underwood, 2007). One aspect of that definition, and the focus here, is the digital divide between

teachers and their students. Prensky (2001) argues that the implications of this discontinuity are profoundly important. He argues that the emersion in digital worlds means that the current cohort of students, and those that will follow them, think and process information in fundamentally different ways from those that have gone before, and this includes their teachers. These students termed as digital natives who are born immersed within a technologically rich digital environment, use technology in qualitatively different ways to other ‘digital immigrants’. Prensky (2001) makes quite a coherent argument regarding the problems of education:

> single biggest problem facing education today is that out digital immigrant instructors, who speak an out-dated language (indicative of the pre-digital age), are struggling to teach a population that speaks an entirely new language.
>
> (Prensky, 2001, p. 2)

The concept of the digital native is at least partly grounded in the belief that students are effective managers of their own digital world, based on the premise that students are information savvy and able to effectively multitask with various technologies. There are a number of strong voices questioning the importance of being a digital native. Kirschner and van Merriënboer (2013) dismiss the concept of digital natives as an ‘urban myth’. They argue that, for example, Veen and Vrakking’s (2006) characterization of the net generation is not tenable. This generation sees learning as playing, is endowed with the skills to construct learning from the flow of digital data and so relegates school to the place for meeting and socializing rather than learning. Others have also questioned the concept of the distinct net generation. For example, Margaryan, Littlejohn, and Vojt (2011) found that current university

students use only a limited range of technologies for learning and socialization. When used for learning, technology was largely restricted to the passive consumption of information. If more advanced technology use was required, as in say a problem-solving scenario, then direct training was required if any effective learning was to take place.

A significant finding from much of the research in this area is the lack of homogeneity of the net generation. Jones, Ramanau, et al.'s (2010) survey of first-year undergraduates studying a range of pure and applied subjects found a complex picture that they describe as a collection of minorities. There was a small group of non-technology users. The largest group of users showed a reliance on simply downloading or uploading materials to the Internet; while most active users of more advanced functionalities were confined to a small minority of students. These results are not confined to the net generation. Underwood and Stiller's (2013) descriptions of technology use by teachers in technology-friendly schools found four distinct groups of teachers based on levels of technology awareness but when actual use was taken into consideration, there was clear division between a small group of teachers resistant to technology at all costs and three groups which, while having different perceptions of the technology, essentially used the same functions due to institutional constraints such as access time, timetables and workloads. To conclude that any one cohort is a homogeneous group as far as its response to technology is concerned is too simplistic.

Selwyn (2006) has queried whether these concerns as exemplified by, but not limited to, Prensky are really so important. His interviews with 84 UK secondary school students revealed students' frustration at not being able to use technology, particularly the Internet, because of

resource levels and risk-aversive measures taken by their schools (see Underwood, Ault, et al., 2005). However, most students understood and accepted the problems faced by their schools although a minority did display frustration and disenchantment. This is a worrying minority trend because such students are likely to be demotivated and possibly disruptive if such feelings persist. However, Prensky (2001, 2006) and Green and Hannon (2007) are concerned with a digital divide that is perhaps more profound than simply feelings of frustration and demotivation. From their own research these authors argue that teachers (and very often parents) do think and operate in remarkably different ways to the younger generation who have been immersed within this technologically-rich digital environment from birth. It could be argued that while teachers remain serial thinkers from the book-age, students' parallel process and multitask. Students are more graphical while teachers are still focused on the written word, the former producing multimodal presentations rather than an essay to express their thoughts and arguments.

There is then a growing realization that, as in the old world of books where poor readers abound, the current generation may be digital natives but some have only a basic level of digital literacy. Education, as ever, has a pivotal role in ensuring that all young people attain the necessary competencies, in particular because those who seem most likely to be left behind are already socio-economically marginalized (Facer, Furling, et al., 2003; Selwyn 2009a).

How does Psychological Theory Illuminate the Educational Debate?

In the past two decades of the twentieth century within the United Kingdom it has been government-led policy to focus on classroom pragmatics resulting in an undervaluing of theory. Thus, educational practice was cut off from its feeder roots within psychology, sociology and other key disciplines. There is now a greater willingness to accept that psychological theory might have a place in supporting and developing pedagogic practice and the promotion of effective learning, due in part to the excitement aroused by recent developments in the areas of cognition, education and neuroscience. However, translating learning theories into practice is not always easy, not least because there are seemingly competing theories, which represent learning as response strengthening, information processing or knowledge construction (see Lajoie & Derry, 2013, for a fuller debate). But psychological theories and models have a great deal to offer the debate around learning through digital technologies.

Psychological models focus not simply on the affordances of the technology but how the learner's cognitive, behavioural and affective characteristics can be improved or sustained through their own engagement with the use of these technologies. The shift from 'content' to the 'process' of learning, which du Boulay (2000) records, has been accompanied by the shift in the recognition of the importance of the affective dimension of learning, which emphasizes that students' motivation is pivotal. The concept of Self-Regulated Learning (SRL) has emerged from the more extensive literature on Self-Regulated Behaviour (SRB). Vancouver (2000) defines self-regulation as the processes involved in attaining and maintaining (i.e., keeping current) goals, where goals are internally represented desired states (i.e. within the self): a mechanism for maintaining and restoring wellbeing and avoiding negative status in all aspects of life and SRL is a

subset of that more general concept (see Banyard, Underwood, et al., 2006). Self-regulated learners draw on their knowledge and beliefs to devise an interpretation of a given academic task. These learners will set goals and think about the skills and strategies for achieving their goals. They monitor their progress by judging their success against their goals (Zimmerman, 1989) and they recognize deviations from their expected rate of progress. Of course self-regulation is not always the most strategic or effective approach to achieving academic success. Deci and Ryan (2000), for instance, make a clear distinction between autonomous and controlled behaviour regulation. In the former, goals emanate from the individual and are set as a result of personal importance. In the latter, controlled regulation occurs when the individual feels coerced or pressurized into achieving a goal set by external but also internal forces. This may lead to less effective or less sustained learning in the long run.

Larson (2000) approaches the issue of ‘what’ and ‘how’ we learn from the perspective of positive youth development and places particular emphasis on how we motivate individuals and develop their capacity for initiative. He argues that the capacity for initiative is an essential twenty-first century skill that is restricted among our younger generation, who have few opportunities to learn given the closed experiences provided within the school environment coupled with unstructured leisure time. He has established that organized activities, such as participating in sporting teams or clubs, are effective ways of developing this capacity for initiative. These activities are productive because they engender intrinsic motivation, concentration and cognitive effort. They also require cumulative effort over time to achieve a goal. Figure 1.1, taken from Larson’s data, demonstrates a cross-over effect between levels of intrinsic motivation and concentration,