

Games And Students: Creating Innovative Professionals

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ABSTRACT

To create professionals for the future, who will be innovative and internationally competitive, we need to change the learning environment. The current traditional delivery systems of education do not develop the necessary interpersonal, analytical and creative skills to deal with the new knowledge economy. Baer (2005), in calling for a new model of learning, says this will require collaboration between educators and game designers to research how games are best aligned with the targeted learning environment and needs. The incorporation of games will require realistic assessment of the current structure of education so that “students’ ability to participate in complex social practices; learn new knowledge and perform well in novel, changing situations needs to be considered valuable learning” (Squire and Jenkins, 2004, p.31). When games and simulations are combined with technology they can generate the environment within higher education that can produce the highly-skilled professionals which are required.

Keywords: Education; games; students; learning; survey

INTRODUCTION

At present economics is seen by students as problematic, abstract and theoretical. This results in their disengagement from a subject that tries to capture the complex world of economic interactivity both at a micro and macro level. If they disengage from the subject at undergraduate level then how are we going to create innovative economic professionals who have to deal with messy and complicated real world issues? So how do we create analysts who are not only able to generate data, but analyse and interpret its meaning so that decisions can be made and policy implemented?

Is the solution to add on more lectures and workbooks? No, the answer lies in changing the learning environment and the manner in which the content is taught, by breaking the traditional method of lecturing, and combining it with games.

TRADITIONAL RESPONSE

Traditionally the response is to ignore the learning environment and look at the educational production function model. Parker (2006) looked at the relationship between the inputs and outputs within the education process. The goal was to identify the dominant factors that could influence students in their first year of economics learning in order to help formulate effective teaching and learning interventions.

The overemphasis on the need to diagnose factors that could influence a student’s performance as well as the need to identify the mindsets that could inhibit learning can only partially explain the cause of continued underachievement.

Think of university economics and you will probably think of lecture theatres, textbooks, lecture notes, lectures, exercises, exams and supplementary exams. Unfortunately, nothing has changed and the educational content is still typically transmitted through chalk-and-talk sessions. In general, most lecturers follow this form of academic tuition which is considered to provide sufficient conditions for learning to take place.

This view was supported by a study undertaken by Becker and Watts (2001) which compared surveys of academic economists in the United States during 1995 and 2000. In their report they found there was an increased emphasis and interest in teaching but, that there had been no change in teaching methods which were still “chalk and talk” classroom presentations. This occurred despite attention being given to co-operative and active learning methods, and to alternative assessment techniques – still there was little change in undergraduate courses. The average time spent lecturing in all courses is 83%. Time devoted to the use of chalkboard for text writing and graphs during class is estimated at 83%.

Gibbs (1982) in a comprehensive critique of lecturing found that:

1. Lectures are no more economical than other methods of teaching.
2. Lectures were no more effective than other methods at conveying information to students. Particularly in helping students to apply knowledge and analyse problems.
3. The idea that lectures ensure that ‘the ground is covered’ by the lecturer is true. The same, however, does not apply for the student as there is little evidence from philosophical, educational and physiological theories of a direct relation between what is taught and what is learned.
4. In general lectures are seen by students as overloading, confusing and traceless. Despite 50 years of improvement in teaching technologies, there is no evidence to prove that today’s lectures are better. (Ramsden, 1992, pp.54-155).

Yet, in spite of such criticism from Gibbs, the lecture mode remains the dominant form of tuition. All that has happened is that instead of unclear hand-written overheads, we have upgraded to colourful legible PowerPoint presentations.

In addition, in the context of South Africa, the oral nature of African society must affect the type of learning that takes place. So learning through written academic texts with no relation to society may disadvantage African students. This may result in these students (who are second-language learners) employing strategies to acquire the discourse such as “borrowing others’ words”, route answers and plagiarism.

The oral culture of African students may mean that conversations in a lecture may need to be expanded to facilitate learning. The voice of the lecturer and that of fellow students would assist the student in developing the discourse necessary to competently complete the task, as “Conversational interaction naturally links the known and the new. It creates its own expectancies, and its own context, and offers choices to the participants” (van Lier, 1996, p.171).The mode of lecturing needs to be diversified away from the traditional set of lectures and notes to make space for new methods of relating. So where does the solution lie?

GAMES

The solution could be achieved through the introduction of games in the formal lecturing programme. A paper by Tompkins (1998) showed that games are an extremely valuable method for second-language learning as they encourage thinking and creativity, allow students to develop and practice new language and behavioural skills in a relatively non-threatening setting, and can create the motivation and involvement necessary for learning to occur.

As most of the students at DUT are second-language speakers the use of games in economics could provide a means of facilitating acquisition of the language of economics and concepts in a more meaningful context.

Mason and Fabritius (2000) state that the use of classroom experiments (games) can provide hands-on exposure to economic principles, increase attention and performance, result in higher interest in outcomes and interrelationships of the concepts since they are introduced through a process where students directly participate.

The use of educational gaming in economics, therefore, could be the key to “the longstanding goal in education of how to promote situations where a person is motivated to learn, is engaged in the learning act, is willing to go to great lengths to ensure learning will occur, and at the same time finds the learning process (not just

the outcomes) to be satisfying and rewarding” (Rieber et al, 1996, p.5). If this type of learning could be achieved then the motivation to study economics could become sustainable and create interest in the acquisition of more economics majors to fill the skills shortage gap.

The traditional lecture has led “students come to think of knowledge as a packet of content waiting to be transmitted” (Venter, 2001, p.89). The lecture becomes the delivery vehicle of factual subject knowledge to the students. This minimalist learning environment encourages passive and rote learning, leaving little room for problem-solving or exploration of facts (Wilson, 1995).

Reimann (2004), in reviewing first-year teaching-learning environments in economics at three different universities in the UK, found a pattern similar to that of minimalist learning environments. These were characterised by:

- A neoclassical approach to economics;
- A uniform lecture-tutorial approach which emphasises passive learning;
- Content-driven, fast-paced lectures;
- Complemented by textbooks and tutorial worksheets.

Under this system of learning “ we are forced to learn by rote that is in no way connected to anything important in our lives.....being alien to our own life experiences outside the academic setting, they slip easily off our shoulders.....and vanishes” (Gruender, 1996, p.21).

This may explain why many lecturers complain that students do not retain knowledge from one year of study to the next or even from one semester to the next. It may also explain to some degree the problems of plagiarism amongst students, as rote learning is simply the restatement of fact as indicated by the lecturer or the text. So what would be wrong in providing an answer word-for-word if it is correct?

In order to change the method of teaching delivery, we need to review our ideas about learning and the current tradition lecture. In this process of re-examining our idea of learning, we will consider the constructivist, transformative and brain-based learning theories.

CONSTRUCTIVIST APPROACH TO LEARNING

In constructivism, learning focuses on the fact that knowledge is actively built up by the learner. Learning, therefore, actively takes place through an individual’s interactions with his/her environment or culture (Rieber, 1996). To summarise the constructivist’s view learners are “actively constructing knowledge on what they already know and understand, rather than as passive recipients of knowledge” (Biggs, 1999, p.12).

According to the constructivist theory of learning one would seek to make the learner, not the lecturer, the focus of the learning environment. This would encourage inductive learning through discovery. Salisbury-Glennon et al (2001) point to the idea that a variety of tasks which are challenging and meaningful will result in intrinsic motivation, by providing opportunities for taking responsibility for and ownership of their work.

Biggs (1999) notes that learners become part of the learning process at a deeper level feel actively involved in the process and take ownership for their own learning. The role of the lecturer is changed into a manager of knowledge, a facilitator who provides guidance, a helper and an assistant (Goldman et al, 2002).

This view, therefore, would require the rethinking of how to deliver teaching in a way that develops independent learners who are able to take responsibility for their learning. In addition, this may require a shift away from lecturers being responsible for lecture hours to managing the learning hours of students through creating tasks not bound purely by the lecture timetable.

Constructivism is a dynamic process that continuously enables us to create meaning about our world which is built on our experiences through our senses. If the learner is actively engaged in the reconstruction of experiences

then learning occurs when he or she resolves the discrepancies between what is known and the newly-acquired knowledge.

Vygotsky (1978), a social constructivist, introduces the concept of ‘the zone of proximal development’ to differentiate between pre-school learning and what happens when schooling begins. The zone of proximal development is the “distance between the actual level of development as determined by independent problem solving and the potential level of development as determined through problem solving under adult guidance or in collaboration with peers” (ibid, 1978, p.86).

In creating a learning environment under these conditions as a facilitator, one would strive to encourage learning opportunities that would result in the closing the “distance” between independent learning and facilitated learning. This is due to the fact that development in the learner will only occur when the learning, in collaboration with others, is internalised.

Learning that is successful only occurs when it is internalised into the schemata of experience of the learner. This process of internalisation means that students have to actively grapple with the knowledge in an inductive manner.

At present, the process of lectures occurs through a deductive process of examples via lectures and books that occur in a context where students are passive recipients of knowledge and in a de-contextualised environment. The development of educational contexts in which they have to engage and internalise knowledge, where learning is put into the hands of students, will create richer environments where deep learning and meta-cognitive thought processes can be developed.

However, the learner does not grow up in isolation and constructivism takes this into account. Social factors affect learning and behaviour. The individual learning process takes place in a particular social environment influenced by culture and prior learning. Thus from a constructivist perspective learning is a process that helps us to make sense of our world (Lorsbach & Tobin, 1997).

As constructivism suggests there is more to learning than mere conditioning - there are additional components such as imagination, intuitions, feelings, values and beliefs which have to be taken into account and cannot be separated from the cognitive processes of the brain (Ibid, 1997).

This, however, does not mean that the existing knowledge base must be ignored, and content and theory must be discarded. Further critical questions need to be asked about what students should learn through activities and how lecturers should work to ensure that learning is successful. “Successful interaction learning design, which engages learners actively in exploring knowledge and experiences, is a result of careful analysis of the learner and learning outcomes” (Goldman et al, 2002, p.4).

Under constructivism, learning therefore cannot be not a mere accumulation of facts but, rather an interactive process of creating meaning out of the knowledge and skills acquired from society that results in meaningful change in behaviour and attitudes.

TRANSFORMATIVE LEARNING THEORY (ADULT LEARNING THEORY)

The theory of transformative learning has been researched and developed in the field of adult education. Developed by Mezirow, transformative learning theory has evolved “into a comprehensive and complex description of how learners, construe, validate and reformulate the meaning of their experience” (Cranton, 1994, p.22).

According Imel (1998) the perspective of transformation explains how meaning structures, which adults have acquired over a lifetime, become transformed. These meaning structures act as frames of reference that are based on the total experience and cultural context of the individual influencing how they behave and interpret events.

These structures may change as an individual integrates new ideas within an existing scheme and this occurs through learning. For individuals to change their meaning schemes, “they must engage in critical reflections on their experiences, which in turn leads to a perspective transformation” (Mezirow, 1991, p.167).

These meaning schemes are based upon experiences that can only be deconstructed and acted only if there is a “disorienting dilemma”¹ that causes a series of phases including: “self-examination, critical assessment of assumptions...development of plan of action, acquisition of knowledge and skills for implementing the plan.... and reintegration into life on the basis of new perspectives” (Imel, 1998, p.2)

The transformative perspective of learning shows that learning occurs when the learner is actively engaged in the process. All the activity undertaken is on the part of the learner in the learning process. Furthermore, if there is no meaning attached to learning, individuals will not change their meaning structures resulting in no change in behaviour or interpretation of events.

Perhaps the lack of meaning attached to learning is causing the inability amongst learners to transfer knowledge between one scenario and another. This is cited as a common problem in examinations where, if the wording or scenario is different, learners battle to succeed.

Dirkx (2000) elaborates further on transformative education theories by looking at Boyd’s view which focuses on the emotional and spiritual dimensions of learning often ignored by the rational cognitive approaches.

Transformative learning in practice, as described by Imel (1998), is comprised of the following:

- The role of the teacher – facilitates the creation of a “community of knowers”;
- The role of the learner – learners as a community of knowers are responsible for constructing and creating conditions for transformative learning to take place;
- The role of the rational and the affective – learning has two layers: cognitive, rational, and objective versus intuitive, imaginative and subjective. Both need to be addressed and connected.

The link between constructivism and transformative learning is that the learner creates meaning. He/ she is an active constructor of knowledge and meaning. The lecturer becomes the facilitator in the learning process and guides the learner in the process of developing knowledge and meaning of the subject.

THE BRAIN AND THE LEARNING PROCESS

The brain and learning process cannot be separated – we learn with our brains. These insights are a result of neurological research into how the brain naturally learns, and has resulted in the development of this type of learning. As we take a look at brain-based learning we will notice an overlap with the theories of constructivism and transformative learning.

In accordance with the discoveries of how the brain learns, there have been suggestions made on how classroom practices can be modified. Caine and Caine (1990) provide the summary of what recent research suggests and what the possible teaching implications could be.

The first is that the brain performs many functions simultaneously and learning is therefore enhanced by a variety of stimuli (Ibid, 1990). The teaching suggestion is that a variety of teaching strategies be used, ranging from individual learning times, group interactions and physical variations, to develop a student’s learning experience.

Jensen (2000) compliments this notion that a rich, complex and multi-sensory environment encourages the brain to learn. Roberts (2002) suggests that the teacher becomes an orchestrator of learning environments rather than an instructor. That learning environments, therefore, need to employ multi-modal instruction techniques (visual,

¹ Disorientating dilemma can be described as the “discrepancy between what a person assumed to be true and what has been experienced” (Cranton, 2002, p.66).

auditory, kinaesthetic) and multiple intelligence activities (Gardner, 1985). The introduction of simulations, role-play into learning environments and the components of challenge, novelty, choice, feedback, social interaction and active participation would further encourage learning.

Caine and Caine's (1990) second insight is that the search for meaning is innate. The mind's natural curiosity can be engaged by complex and meaningful challenges. Educators should therefore strive to present lessons and activities that arouse the mind's search for meaning. Roberts (2002) supports the notion that the brain is designed to search and integrate new information into meaningful patterns. If the information is meaningless then the brain actively resists. Hill (2001) suggests that our brains sort information according to whether it is associated with content or context.

Content information that is driven by rote learning, which is not brain compatible, requires continuous effort to retain knowledge. Context-learning, however, seems more effortless.

Willis (2006) suggests the metaphor of "educators as memory enhancers, not just information dispensers" (Ibid, 2006, p.24). Through research Willis shows that learning without meaning is stored in the short-term memory and in the remote areas of the brain which makes it difficult to locate and for the information to be retrieved. Learning, on the other hand, that has meaning is stored in the long-term memory and is more easily retrieved.

The principles of pattern- and meaning-making reinforce practices we attribute to constructivism and transformative learning which, in turn, emphasise the context and framing, active learner involvement in the teaching material, alternating the big picture, reflection components and relevancy. Caine and Caine (1990) highlight that emotions and cognition are crucial to the storage and recall of information, therefore, the learning environment should promote positive attitudes among teachers and students. Furthermore, students should be aware of their feelings and how emotions affect their work.

According to Hill (2001) emotions are vital to thought and learning i.e. the body, emotions, brain and mind are an integrated system and emotions are enmeshed in the neural networks. Emotions also play an important part in the encoding and retrieval of memory, and this can have positive and negative effects on learning. On the one hand, meaningful and relevant information tends to be learned and remembered. In contrast emotional reactions such as depression, anxiety and stress can have a negative impact on learning and retrieval.

The implication is that learning environments need to take cognisance of the emotions so as to create motivationally challenging situations rather than those which cause uncertainty and anxiety. Caine and Caine (1990) suggest that learning requires focused attention. It is impossible to learn and remember information to which the brain has not paid any attention.

De Boer et al's (2001) research on the human brain suggests that whole brain teaching and learning, bridges the gap between the unique individual and the design and delivery of learning. This means that lecturers have to take students' learning preferences into account when designing learning opportunities. This will accommodate the learners' thinking preferences and areas of lesser and avoidance is activated (de Boer, 2001, p.192).

In summary, Engel et al (2006) state "the healthy brain is, however, anything but a passive receiver of news from the environment. It is an active system, one that controls itself via a complex internal dynamic. Our experiences, intentions, expectations and needs affect this dynamic and thus determine how we perceive and interpret our environment" (Ibid, 2006, p.2). The brain therefore cannot be compared to a computer but rather more like a jungle ecosystem (Sylwester, 1993/4). This means that learning environments have to change to encourage learners to actively acquire meaningful information and in turn be motivated to learn.

Summary Comparison of Traditional Education versus Alternative Approaches

	Traditional Education	General Principles that have emerged from looking at Constructivist, Transformative and Brain based learning approaches.
Learning Space	Lecturer driven Text driven Theoretical Learner Passive	Learner Centred Context driven Meaningful Learner Active
Respect for Learners and their Experience	Limited	Important, because people construct new knowledge and understanding from what they already know and believe based on their previous experience.
Instruction method	Monologue from lecturer and texts	Variety of learning experiences facilitated by lecturer from individual, to group, from games to role play etc...
Goal of learning	More focused on impressing information on the mind of the learner	Opportunities for the learners to express and test in action what they have learned.
Motivation for learning	Pass or fail	Curiosity, novelty and reality of the learning experience.

SUMMARY

In looking forward, Shaffer et al (2005) indicate that education systems need to move away from the fact fetish to ways of thinking. In a similar vein, Gee et al (2005) state that “traditional academic disciplines – were derived from medieval scholarship and constituted within schools developed in the industrial revolution - a new model of learning through meaningful activity needed to be developed”.

This drive to create a new model of learning, through meaningful activity led Gee et al and Shaffer (2005) to the promotion of Epistemic Games as a solution. In these games, which are not just about knowledge but knowledge in action, players learn to work and think as innovative professionals.

Ellington (1998) captured the need for learners to be able to adapt their knowledge to diverse experiences in the following quote: “We live in a complicated and messy world in which work for most of our graduates is a continuous stream of ‘problems’ that have no simple or unique solutions” (Ibid, 1998, p.1).

Therefore, our students need to think creatively to solve problems and this can only occur in active learning environments which could be created by utilising games and simulations. This is supported by Amory and Seagram (2003) who suggest that games can provide a learning environment which:

- affects cognitive functions and motivations;
- stimulates curiosity through challenges;
- provides novelty and complexity;
- promotes goal formation and competition;
- all learners to be active; and
- intrinsically motivates learners.

Games provide an ideal educational opportunity to engage students actively thereby enhancing the learning process at academic institutions. The re-introduction of games into formal academic tuition is built on sound educational principles. The Game Achievement Model developed by Amory and Seagram (2003) aims at designing educational games that simultaneously challenge learners to actively participate in the learning process while achieving particular educational outcomes.

Therefore, part of the diversification process to enhance the learning process could be found in introducing educational games into formal learning time.

REVIEW OF GAMES IN USE IN EDUCATION

The use of games to provide interactive learning environments occurs across a wide variety of disciplines and educational contexts. The aim of this section is to show the relevance of games as a platform for effective learning in different disciplines as well as the discipline of economics.

The words ‘game’ and ‘simulation’, in the context of this argument, are interchangeable as they tend to be merged into one concept when being used to create interactive learning environments.

Huyen and Nga (2003) argue that games bring relaxation and fun that allow them to learn and retain new words easily. The support for this can be found in cognitive sciences where lowering anxiety aids memory and focuses attention (Kennedy, 2006). They further point out that games involve friendly competition, keeping learners interested thereby creating the motivation for learners to participate in language use in real contexts in the classroom. Finally they noted that when ever a game is used the number of students, proficiency level, cultural context, timing learning topic and classroom setting need to be taken into account in order to maximise the effectiveness of the game.

Cooper and Kagel (2003), in looking at lessons learned from games applied in economics, based their experiments on an entry limit-pricing game. They noted two important features: firstly, the growth in ‘sophisticated learners’ who are able to correctly anticipate the impact of their opponents’ decisions; and secondly, the growth in the number of these thinkers with experience. They stated that these results “provide clear evidence that can facilitate the positive transfer between related games” (Ibid, 2003, p.205). Further they note that the meaningful context not only speeds up learning but, can change the nature of the subject’s reasoning process.

Pratt (2004), in implementing the use of macroeconomic simulations in the teaching and learning process of economics, found that these increased student motivation, engagement and performance. He also aligned the simulation with the required outcomes of the course and then introduced a rubric to measure the performance of the students during the games.

Woltjer (2005) developed an interactive game that shows the relationship between company decisions and macroeconomic dynamics. In this real-time computer simulation players get to see the short-term and long-term macroeconomic consequences of their decisions.

Davis J (2008) in examining the results from the questionnaire of the students’ perceptions towards the game being used as method of teaching in economics, found a response to the literature reviewed (Motahar, 1994; Gremmen and Potters, 1997; Meister, 1999; Mason and Fabritius, 2000; Woltjier, 2005) which concluded that students responded positively to this teaching intervention and believed it assisted their learning. The majority of the students stated that the game: “emphasizes the theory in a practical way that made it easier to understand / an easy way to understand the law of diminishing returns”.

The recommendation from the students’ perspective is that the use of games should be used more as a teaching method. The scope for using games to teach economics should be expanded across the curriculum and is expressed by the following quote from Question 22: “It should be done more often - not only for the law of diminishing returns”.

As for proving that these student perceptions translated into increased performance the study was limited in that it could only make a comparison between the control group and the treatment groups.

But it did, however, provide evidence when comparing the groups that those who were exposed to the game had a significantly higher probability of success than those who did not.

Not only can games and simulations improve the quality of learning but, when blend with real world technology used in the workplace, it can equip students with employable skills.

As shown by Ragan, Leahan, Malanoski and Savino (2009) who used a case study on Cottonwood Distribution, Inc. where the students review general accounting principles and procedures in which:

- They create journal ledger entries for a series of transactions;
- review of accounting procedures with additional journal entries and the adjusting journal entries for month end close;
- the students explore how their journal entries might be created in an automated system by entering their “manual” journal entries in the system.

According to Ragan et al (2009) “These case studies are of significant importance as it integrates and reinforces accounting concepts, SAP, and has the look and feel of a student working in the real world.”

They commented that from their survey results that students affirmed that this was a valuable learning experience which they could put to good use after graduation.

Games and simulations combined with real world technology have the potential not only to improve the quality of learning but, also to narrow the gap between academic study and real world application.

In summary then, we need to look again at benefits for learning that are available from games and these are:

- Clear learning goals;
- Broad experiences and practice opportunities that continue to challenge the learner and reinforce expertise;
- Continuous monitoring of progress and use of this information to diagnose performance and adjust instruction to the learner level of mastery;
- Encouragement of inquiry and questions, and repose with answers that are appropriate to the learner and the context;
- Contextual bridging (gap between what is learned and its use);
- Time on task (ability to hold the learner’s attention);
- Motivation and strong goal orientation;
- Scaffolding;
- Personalisation;
- Infinite Patience.

(Summit on Educational Games, 2006, pp.18-20)

All of these attractive features of learning applications from games require us, as educators, to seriously consider games as part of the solution to the puzzle of learning and need to be incorporated into the formal academic learning time of students.

CONCLUSION

Stapleton and Taylor (2003) provide a reminder that a learner still sits in a classroom and the teacher teaches. This process is repeated at Universities where the lecturer lectures students with the aid of new technology. The introduction of gaming through multi-media, videogames, board or classroom experiments should create a more interactive learning environment where learners work out answers and not memorise them.

The inclusion of gaming will enable academics to create a learning environment, which would actively engage their students – moving from chalk-and-talk to interactive learning.

Baer (2005), in calling for a new model of learning, says this will require collaboration between educators and game designers to research how games are best aligned with the targeted learning environment and needs. The incorporation of games will require realistic assessment of the current structure of education so that “students’ ability to participate in complex social practices; learn new knowledge and perform well in novel, changing situations needs to be considered valuable learning” (Squire and Jenkins, 2004, p.31).

In conclusion then, perhaps it time to integrate games and simulations into the formal lecturing process not only as a method of teaching but also evaluation where in the game real world features are included (i.e. economic modelling, data analysis and interpretation) so as to narrow the gap between theory and application thereof in a complex dynamic world.

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