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Utilización de juegos para enseñar la programación empresarial: un análisis crítico.

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Resumen

Introducción. En este trabajo se examina la problemática persistente de la participación de los estudiantes en la enseñanza de programación de computadoras. Los estudios han documentado los desafíos en la programación para la enseñanza a través de computadoras y los diversos métodos que se han propuesto, con distintos grados de éxito. Desde la perspectiva de un educador, la preocupación es cómo involucrar a los estudiantes para permitir la entrega efectiva de los principios de programación de computadoras a los estudiantes. Desde la perspectiva del estudiante, cómo la experiencia deun curso de programación informática dejará a los alumnos con buenos hábitos de programación, la capacidad de aprender por sí mismos y una impresión favorable del campo de los Sistemas de Información como una profesión.

Método. El estudio utilizó un diseño de estudio de caso en el que una encuesta y entrevistas fueron llevadas a cabo entre 138 estudiantes, actualmente matriculados en un curso de segundo año de programación informática en gran universidad urbana en el sur de África. Tres instructores involucrados en la enseñanza de la clase también fueron entrevistados para conocer sus puntos de vista en relación a los ofrecidos por los alumnos.

Resultados. Nuestros hallazgos refutan la idea de que el uso popular de los juegos de ordenador en contextos sociales implica que pueden ser utilizados con éxito para la enseñanza de programación de computadoras para negocio con los alumnos. Esto nos permite, como educadores, estar en una posición de poder sobre los estudiantes, para reflexionar sobre nuestras intenciones en la redefinición de los planes de estudio.

Discusión y conclusiones. Sugerimos que, si bien la innovación pedagógica debe estar vinculado al tema más amplio de la práctica reflexiva de la experimentación, los educadores deben fomentar la retroalimentación de las partes interesadas a través de la "competencia reflexiva", una propiedad necesaria para la transformación del currículo.

Palabras clave: Sistemas de Información, Programación Empresas, Investigación Acción, Pedagogía.

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Teaching Business Programming Using Games: A Critical Analysis

Abstract

Introduction. This paper examines the persistent problematic issue of engaging business students in teaching computer programming. Studies continue to document challenges in teaching computer programming and various methods have been proposed with varying degrees of success. From an educator's perspective, the concern is how to engage students to enable the effective delivery of computer programming principles to the students. From a student's perspective, how they experience the computer programming course will leave students with good programming habits, the ability to learn on their own and a favourable impression of the field of Information Systems as a profession.

Method. The study used a case study design in which a survey and interviews were conducted among 138 students currently registered for a second year computer programming course at large urban University in South Africa. Three instructors involved in teaching the class were also interviewed to gauge their perspectives in relation to those offered by the students.

Results. Our findings refutes the notion that the popular use of computer games in social contexts implies that they can be used successfully for teaching computer programming to business students. This allowed us, as educators in a position of power over students, to reflect on our intentions when re-designing curricula.

Discussion and Conclusion. We suggest that while teaching innovations should be linked to a broader theme *reflexive practice of experimentation;* educators should encourage feedback from other stakeholders to foster 'reflexive competence', a desired property for transformation of curricula.

Keywords: Information Systems, Business Programming, Action Research, Pedagogy

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Introduction

In this paper, we explore the engagement of students using computer games in teaching computer programming by critically examining the intentions of the stakeholders and how the normative context and values influence frequent paradigm shifts in teaching computer programming. Normative context and values are used because this research seeks to demonstrate that using computer games in teaching programming enhances not only student motivation, but also effectiveness in course delivery (Brownfield & Vik, 1983; Klawe, 1994; Ricci, 1994, Venkatesh, 1999). The impact of such research might put pressure on educators to change towards using games in teaching in preference over more 'traditional' approaches. As educators witness high failure rates in computer programming courses, the normative influences of such research provide motivation for changing the teaching approaches in order to improve performance. Our motivation for the paper is to consider whether using computer games enables greater engagement with business students by adopting a critical perspective.

Many business students desire to be business/systems analysts and therefore take programming courses either as a major or as a university requirement to satisfy a set of broad skills and knowledge for a degree in another field (i.e., finance). Many such students show interest in computer programming (Gayo-Avello & Fernandez-Cuervo, 2003), but the majority of them find it a difficult and a complex cognitive task (Guindon, 1990; Jeffries, Turner, Polson, & Atwood, 1981; Kim & Lerch, 1997; Letovsky, 1986; Mayer, 1989; Simon, 1973). Literature cites two fundamental issues related to teaching programming: the selection of a programming language and the most effective approach for teaching computer programming (Al-lmamy, Alizadeh & Nour, 2006; Ottaway, & Chang, 2006; Parker, Chao). We focus on the teaching approach, which continues to be problematic as educators experiment with various paradigms in an attempt to enhance engagement of students.

Approaches that have been advocated include: changing a programming language, using different textbooks, relying on web sources only, slowing the course down, switching between bottom-up and top-down approaches, lowering the standards, using computer games, reducing the course requirements all studies showing no significant results (Baldwin & Kuljis, 2000). The experimentation may be a pointer not only to the difficulty of computer programming but a desire to engage students more in order to enhance effective delivery. For instance, computer programming has been recognized to have a critical pedagogical goal which is in-

tended to provide and reinforce generic problem-solving skills that are so vitally important in today's business world (Moor & Deek, 2006).

Particularly relevant to this paper is the use of computer games for teaching business programming, due to the perception that game play enhances engagement and learning of program design (Al-Bow et al., 2009). There are many studies that support the assertion of increased engagement of students, when computer games are used in teaching programming and they link this effectiveness to the new generation of learners (Chang & Chou, 2008; Rajaravivarma, 2005). Some researchers suggested that computer games are able to offer learning benefits such as risk-taking, problems solving, interaction, situated meaning, exploration, team working (Gee, 2006). Of course this may be regarded as a discourse emanating from the academics. However, there are also studies that capture student's perceptions which are indicative of the acceptance and possible effectiveness of computer games in teaching programming. However, the students' perspective is largely reported, not from a learning environment, but their behaviour from a social context. For instance, Rubijesmin (2007) when looking at the Malaysian situation found out that 96% of male primary and secondary students play computer games while 90% of the females claimed to do so. She also indicated that most Malaysian students are familiar with many genres of computer games and playing games also encourages social skills among the students. The findings from Nor Azan and Wong (2008) indicated that 92% of secondary students have experience playing computer games on various computing platforms. Ibrahim, Yusoff, Omar and Jaafar (2011) cite a number of studies to underscore the fact that motivation is indicated as instrumental in students' use of computer games. For example, Roslina, Rasimah and Azizah (2008) found that 100% of year one and year two students in a local university play computer games, with 35% of them playing games almost every day.

Such studies demonstrate that students are motivated while using computer games for the process of building consensus towards a paradigm of effective programming teaching. However, we feel that the discourse should be extended to capture not only students who are using computer games in activities unrelated to learning computer programming; but also perspectives of students *in situ* of the academic context of learning computer programming. We are calling for extending the public sphere of this discourse, from a critical perspective. The concept of *public sphere*, by Habermas (1984), is employed as a conceptual lens to capture the essence of democratic ideals now recognized between students and educators globally. Democratic ideals are used in this context to highlight the necessity and relevance of

educators and students fostering a positive communicative environment for feedback that is relevant in a teaching environment.

Framework for the Analysis of the Engagement Discourse

In traditional interpretations of the meaning of public sphere, Habermas (1984) considers that the concept is informed by discourses from political parties, politicians, lobbyists and pressure groups, the mass media and currently the vast electronic network underpinned by the Internet infrastructure focused on informing and transforming the public opinion. Further, that the discourses arising from these groups have their basis on the power to select, shape and present messages and to strategically use political and social power to influence agendas and frame public issues without the deliberation of the citizenry (Cukier et al., 2006). We employ the same metaphor of public sphere in a different context; that is the discourse regarding consultation on how to teach learners in universities.

In considering the concept of *public sphere* in the education sector, we recognize similar enabling and constraining conditions for the use of the concept in equal measure to that of the political arena by Habermas (1984). The concern in this section is how to transition to a framework that has been employed largely to analyse political discourse in the political arena to discourses in the educational arena. For instance, Habermas (2006) makes the assertion that those who work in the politically relevant sectors of the media system can exert power by selecting politically relevant content which influences the formation of public opinion and distribution of power interests. We link this assertion to conditions that exist in the education sector by considering a number of issues: Who wields political power? What and whose interests do they serve? Are they structurally independent? Answers to these concerns are likely to aid in positioning the concept of public sphere as a conceptual lens in the education sector. We first enumerate these concerns before operationalizing Habermas's Theory of Communicative Action (TCA) as an analytical lens in this paper.

The answer to this concern in the education sector is grounded in classical learning theories which emphasize educational structures wherein the teacher wields more power than the students (Cazden, 1988; Mehan, 1979). For instance, the teacher designs the mode of interaction and does most of the talking while the student responds to the educator and is evaluated. Power of the educator is also seen in ability to change curricula. The critical concern here is to question whether computer games are effective in teaching programming which is an assertion that has been advanced by educators. The fact that Habermasian Critical Theory

poses the question of who wields power is apt in uncovering the power relations in the quest to use computer games in teaching computing programming. From a classical learning theory perspective, what emerge are the interests that are served by the unbalanced power relationship. This power relationship has important implications for the rationale of introducing computer games when teaching. This research seeks to highlight how such dominant interests may inadvertently help in the perpetuation of the normative pressures for universal adoption of computer games in teaching programming. Thus, the fact that critical theory poses the question of whose interests are being served provides an apt conceptual lens for our analysis in order to go 'behind the curtain'.

Principles of the Conceptual Framework

The Habermasian conceptual framework of Critical Discourse Analysis is adopted as a basis for the interrogation of texts in this study. Specifically, the key concepts and principles of *universal pragmatics*, which have formed some of the major works of Habermas, are employed (Habermas, 1984; 2000). The concept of *universal pragmatics* spells out conditions which not only surround ideal communication oriented towards a mutual understanding regarding a particular phenomenon but also explicates conditions of conscious and unconscious deception in communication (Cukier et al., 2008). It is these underlying conditions to ideal and deceptive communication that provides traction to the theory of communicative action (TCA) as a foundational lens for exposing deep structures, systematic distortions in communicative texts and power relations that is characteristic of any discourse in the public sphere (Fairclough, 1995). Our approach from an action research perspective, sits pretty well with TCA: with the ultimate aim of effective change through the emancipation of participants (teachers, learners, educational policy drafters and other societal actors) involved in the discourse (Brooke, 2002) regarding the effective teaching and learning of computer programming. TCA has been used before as a conceptual lens for understanding discourses surrounding information systems artifacts, and therefore, its validity as a basis for making knowledge claims in the field of informatics is not new (Ngwenyama & Lee, 1997; Cukier et al., 2008). We outline below its relevant principles that were employed as a theoretical frame in this study.

From a Habermasian perspective (Habermas, 1984), any speech text or speech analogue can have two orientations. The first orientation is a communicative role towards achieving mutual understanding of 'group think'; with express intention of attaining success for the speaker. A communicative speech action has a potential outcome of obtaining cooperation

among participants. The second aspect of any speech text or speech analogue has a strategic orientation, again geared towards attaining success for the speaker but notably with a myriad of possible outcomes. Some of the outcomes maybe antithetical to the interests of some participants involved in the social action of assumed democratic discourse. We capture the communicative and the strategic orientation of public discourse outcomes in Table 1.

Table 1. **Communicative and Strategic Speech (Adapted from Cukier et al., 2008)**

Speech Action	Sub-type	Orientation	Outcome
Communicative Speech	None	Achieving Understanding	Cooperation
Strategic Speech	Open Strategic	Achieving Success	Influencing
	Concealed Conscious Deception	Achieving Success	Manipulation
	Concealed Unconsious Deception	Achieving Success	Systematically Distorted Communication

The challenge in any textual analysis is how the readers and listeners can decipher and infer meanings that explicate the orientation of a particular communicative text: whether from the media, policy documents, interview transcripts, or from everyday exchanges. In TCA, the concept of validity claims provides the necessary conditions and general basis for critically interrogating speech by analysing the *truthfulness*, *legitimacy*, *comprehensibility* and *sincerity* of the speaker's speech texts (Cukier et al., 2008). While these validity claims are not necessarily explicit in any text or text analogue, an engaged reader is largely concerned with the implied meanings that are evident. The implied assumption in TCA therefore is that all speech or speech text are communicative, unless one or more the validity claims are found to be wanting.

Thus the four validity claims (*truthfulness*, *legitimacy*, *comprehensibility*, *sincerity*) form the basis for organizing and structuring text, from a practical perspective, for any critical interrogation of text to uncover the underlying communicative or strategic intent. Schoop and Quix (2001) characterize these four validity claims as indicators of potential causes of communication breakdown, especially in a situation where the discourse on an issue is likely to be conflictual.

Operationalizing Validity Claims

Communication *Comprehensibility* is considered as the technical and linguistic clarity by assessing how audible or legible the utterances are and serve as a basis for ideal speech assessment. This validity claim is orientated towards syntax with indicators such as completeness of the symbolic representation, the presence of a shared language and the utterance's syntactical and semantic correctness. The pragmatic test of comprehensibility assesses intelligibility, completeness of communication and whether jargon has been employed by the speaker to obfuscate meanings. Thus a potential distortion as an indicator of comprehensibility of communication is the reader's state of confusion after listening to or reading the text.

The *truth* validity claim emphasizes evidence of fact or a common experience, so that the reader can share in the speaker's knowledge. Potential distortions of truth claims need to be identified as falsehoods, biased assertions and incomplete statements against which counterarguments cannot be formulated, which lead to manipulations (Van Dijk, 2006). The validity test for a truth claim is for the reader to assess whether the evidence or facts and the reasoning given are sufficient comparative to the reality of the 'objective' world of the phenomenon under discourse. This requires a consolidation of understanding between the context of the discourse (in our case, justifiable arguments for the effectiveness of teaching programming using games) and analysis of the argumentation from the text analogues (Ngwenyama et al., 1997; Toulmin, Rieke & Janik, 1978). The potential for communication distortion through *misrepresentation* for the truth validity can be gleaned from general standards of rational argument evident in the speaker's text by looking at its logical consistency, completeness and defensibility as indicators of quality in argumentation (Toulmin et al., 1978).

The validity claim of *Sincerity* looks at the sincerity or honesty of the speaker by looking at the correspondence between the utterances and the intention of the utterances. The truthfulness of the speaker's utterance should be sincere in expressing his or her intentions, so that the hearer can trust the speaker. The validity test should consider whether what is said is consistent with how it is said. Due to the difficulty in addressing this validity claim, the onus is on the analyst to understand the wider discourse. Then link what is said in the wider discourse to the *intention* of the speaker in order to unearth any *false assurances* that elicit an emotional responsive of the reader.

The *Legitimacy* claim looks at the appropriateness of a speech text in relation to the relevant normative context, values, or standards, so that the hearer can agree with the speaker

in these values (Ngwenyama et al., 1997). This may involve widening the scope of stakeholders in order to take into account opposing 'logics' to aid in reinforcing or falsifying a speaker's legitimacy claims. Thus an indicator of probable illegitimacy as an indicator in the breakdown of communication is the degree of representation and silencing of dissenting voices (Van Dijk, 2006). Another is the choice of experts and the ways in which they are used to influence readers to accept certain arguments. Table 2 summarizes the validity claims discussed above

Table 2. **Discursive Indicators of TCA (Adapted from Stahl et al., 2005)**

Validity Claim	**Potential Distortion**	**Empirical Indicators**
Comprehensibility	Confusion	C1. Is there use of jargon? C2. Is there evidence of obfuscation?
Truth	Misrepresentation	T1. What is said about the use of games in teaching computer programming? T2. Are the issues and options clearly defined? T3. What challenges and benefits have been identified and assessed? T4. What evidence has been provided to support these arguments? T5. Has the relevant information been communicated without distortion or omission? T6. Are there ideological claims which are unexamined?
Legitimacy	Illegitimacy	L1. Who is speaking, who is silent, what are their interests? L2. What is privileged? What is not said about the approach? L3. What is assumed or implied? L4. What is missing or suppressed in the discourse? L5. How are the decisions legitimized? L6. Who is involved? Who is not involved? L7. What are the stakes and interests involved or excluded?
Sincerity	False Assurance	S1. Do metaphors and connotative words promote or suppress understanding? S2. Do metaphors and connotative words create false assurances?

Method

Action research, which is regarded as participatory, emancipatory and contextual (O'Brien 2001), was adopted in this study. Participatory, since the researchers in this study were the educators involved in teaching the computer programming course to the business students at a large urban South African university based in the administrative capital. The study is emancipatory, since the educators involved sought to address the problems that the course was experiencing prior to 2001. Some of the problems included high failure rates in the programming courses offered to business students and subsequent low enrollment in the courses. Therefore at the beginning of 2011, the educators involved in the teaching of computer programming resolved to redress the problem of high failure rates by enhancing the engagement of students through the use of computer games. The issue of context can be argued from the focus of the study, i.e. students majoring in Informatics as a Business Degree at the case study university. The study used a case study design and a survey and interviews were conducted among 177 students currently registered for a second year computer programming course at large urban University in South Africa. Three instructors involved in teaching the class were also interviewed to gauge their perspectives in relation to those offered by the students.

Participants

The total population for the survey component comprised of 177 second year students taking a business-oriented programming course at a large urban university based in the administrative capital of South Africa. The programming course is offered by the Information Systems department. The course has a coordinator/theory educator, two practical educators and two tutors. Typically, a theory lecture would be delivered by an instructor after which the students would be provided with a practical assignment to be completed in the computer labs. During these lab times, the practical educators and tutors would be present to support the students as they complete their assignment. The business programming course is a one year course which runs from February to December and is offered to students taking various majors such as Informatics (Information Systems), Information Science and Computer Science. The participants that were targeted for the survey were Informatics students, who have a business orientation to computing and who take up professional appointments as business/systems analysts on completion of their studies. The electronic survey data was collected during the first half of 2011 (February to July).

Out of a class population of 177 students, 77 students majored in informatics and therefore the business programming course is a required class for their degree. From the sam-

ple of 77 informatics students, usable responses were obtained from 40 students, giving a response rate of 52%. The survey component sought to assess some of the validity claims that arose from interviews with some of the participants. A majority (78%) of the student respondents were between 20 to 25 years old, while the rest (22%) were aged between 17 to 19 years with an average age of 21 years. The qualitative component of the study involved interviewing the instructors (one theory and one practical instructor). Further, an additional 16 Informatics students were interviewed in the second half of the year, as a follow-up to the electronic survey to establish reliability of the data.

Material

Data from interviews formed the primary source of information for this study. The interview transcripts were coded by the three educators who were involved in teaching the computing programming course. A comparison of the transcripts and how they mapped to the themes was done to ensure reliability in the coding process. In addition, survey data was used to capture descriptive aspects of the study such as demographic profile of participants and to what extent the respondents used computer games.

Procedure

The research process involved a number of phases: planning, action and reflection. In the *Planning* (Focus on Learner and Strategies) phase of the action research process (after Boud and Walker, 1990), the staff members of the department of Information Systems help a planning session in October, 2010 during which the problem was diagnosed (high failure rate and low student enrolment) and alternative strategies identified and selected (using computer games in teaching plus others strategies). In the second phase of *Action* (action planning and intervention) which occurred from February 2011 to June 2011, we developed a plan to implement the strategy of implementing the teaching programming using computer games. The affected course involved teaching object – oriented programming plus database concepts to second year university students. After resolving to use computer games, the instructors of the course wanted to provide the students of the course with an opportunity to explore different concepts related to Object Orientated Programming in a practical manner in the course. For this reason the instructors decided to ask the students to develop a game in the typical Role-Play genre.

Role playing games, has at their core, a character system which stores and manipulates various attributes of the player character and any non-playing characters in the game. This type of character system is ideally represented using classes and objects and was thus chosen as the metaphor that would be used to help the students explores Object Orientated Programming. The sequencing of the lessons required the theory lecture to demonstrate the game (developed by the instructors) in class, after which an assignment similar to the one demonstrated by the instructors would be handed out to the students to complete in the computer labs. The games were created using Visual Basic 2008 while database concepts illustrated using Microsoft SQL Server 2005. The third phase of *Reflection* (July to November, 2011) involved evaluation of the implemented strategy and identifying general findings. This is presented as the findings of this study.

Data Analysis

The primary mode of analysis was thematic analysis. There are two versions of thematic analysis: inductive and theoretical thematic analysis (Braun & Clarke, 2006). In an inductive approach, the themes identified are strongly linked to the data themselves, which in the end may bear little relationship to the specific questions that were asked of the participants (Braun & Clarke, 2006). The themes identified in the inductive approach would not be driven by the researcher's theoretical interest in the area or topic. Theoretical thematic analysis on the other hand is driven by the researcher's theoretical or analytic interest in the area and is thus more explicitly analyst-driven (Braun & Clarke, 2006). This paper employed theoretical thematic analysis even though it is recognized to provide a less rich description of the data overall but allows for a more detailed analysis of some aspects of the data. Theoretical thematic analysis was selected because the data was coded using the discursive practices identified under Habermasian CDA discussed earlier.

Results

The interview transcripts and other texts were read and tested to unearth the implicit and explicit validity claims. This is a process of critical interpretation in which the meanings arising from the texts are understood in the context of the political situation and their implications to the participants (Larsen, 1991). The analysis that follows illustrates how we critically examined and tested the validity claims based on CDA.

Comprehensability Claims

We base our analysis of comprehensibility on the notion of *obfuscation.* That is the concealment of intended meaning in communication, making communication confusing, intentionally ambiguous, and more difficult to interpret in order to manipulate the reader towards a particular orientation. We look for the evidence of obfuscation in the kind of jargon that is employed by the respondents as they try to 'skirt' around a particular issue or how the social problem of better student engagement in teaching computer programming is positioned in context. Table 4 captured statements from the research participants which provide a basis for the analysis of comprehensibility claims.

Table 4. **Comprehensibility Claims**

Empirical Indicators	Interview Excerpts
C1. Is there evidence of obfuscation?	I did ***computer science*** since school so I have had it ingrained into me from school and I also think that way – I think very logically so for me it comes naturally but if I had to think back, I don't think we learnt the logic so much of how to program, its more of learning the concept of just HOW TO DO IT. **[E1]**. Yeah, let's see, that's a whole other ***kettle of fish***, but yeah, because, and in the second course we've got ***computer science students*** who also take my course and they find it very easy but the business students find it very difficult, um so there is a bit of a disjoint between the business students understanding the programming **[E2]** I come from a ***computer science*** background the people I usually work with have come from a ***business or informatics*** background so there's two different approaches **[E2].**

The starting point in explicating the nature of obfuscation evident in the texts is to understand the mental models of the educators or lecturers involved in teaching computer programming to uncover the strategic intent of their speeches. This normally implies that a dominant actor (educator as opposed to student) needs to construe a mental representation of the current communicative situation in which he or she is at the center of such a representation and his or her role of being an academic provides legitimate domination. In other words, the academic construes a context model of the communicative situation that provides background justification for the *course of action* evident in the speeches. In this case, the course of

action is a change in teaching approach which relied on business examples to an approach that uses game programming. However, our interest is to uncover the concealed logic that gave traction to the other validity claims.

Statements E1 and E2 in Table 4 are from the instructors. An interpretive analysis of the statements appears to elevate the logic inherent in the teaching approach in computer science programs over approaches in business programs. We see this as an attempt to vilify either the absence of logic in equivalent business programs or the aptitude of business students in understanding computer programming. The respondents maybe inadvertently making the claim that the success of the computer science logic is well suited to teaching computer programming, yet when this claim is assessed in light of teaching game programming to business students, then *some masked flaws* (as sources of obfuscation) become illuminating. For instance, a review of literature supports the notion that there is widespread and undeniable interest in computer games on the part of computer science students and among university students in general (Jones, 2003). Part of this interest is hinged on the fact that the computer gaming is an enormously successful industry, responsible for pushing innovation in computing and providing careers for many computer science graduates (*not information systems graduates*). Evidence further suggests that courses employing game programming boost student enrolment and retention in computer science programs (Parberry, Roden and Kazemzadeh, 2005).

However, what is *obfuscated* in the underlying computer science logic is that when computer game programming is taught, it is frequently in *upper level or capstone courses* (Jones, 2003; Parberry, Roden & Kazemzadeh, 2005). The underlying logic for delaying the teaching of computer gaming in computer science is because it requires students to have some programming and conceptual sophistication (Distasio & Way, 2007). Such concepts as user interface design, data structures, object-oriented design, algorithms, software engineering, graphics, artificial intelligence, and just about any other topic common to a computer science curriculum must have been covered prior to undertaking computer game programming. When this required programming and conceptual sophistication is assessed in the context of Information Systems as Business Programs, then evidently the logic is flawed.

Recent thinking in the Information Systems community is orientated towards downgrading the role of computer programming as part of the core of the discipline. For instance, the latest Information Systems model curriculum recommended the removal of applications

development (Programming, Data, File and Object Structures) from the core of IS Curricula even though there was a strong case for their inclusion as a minor in an IS curricula (Topi et al., 2010). Therefore, instructors of the course attempt to elevate an approach to teaching computer programming, which requires a higher level of sophistication in computer science programs, but which has also been considered by the wider Information Systems community as irrelevant. It is on these bases that we now make the claim that we are trying to obfuscate the real nature of comprehensibility claims through recourse to *computer science logic*. Thus orienting the teaching of business programming based on computer science logic may result in undesirable consequences, such as the high failure rates reminiscent of student results.

Truth Claims

Analysis of truth claims focuses the reader on possible *misrepresentation* of facts in the texts in the form of falsehoods, biased assertions and incomplete statements against which counterarguments cannot be formulated, which lead to manipulations (Van Dijk, 2006). This requires a consolidation of understanding between the context of the discourse (in our case, justifiable arguments for the effectiveness of teaching programming using games) and analysis of the argumentation from the text analogues (Ngwenyama et al., 1997; Toulmin et al., 1978). Of course the practical challenge is how to assess the distortion of facts by the various speakers. From a stakeholder perspective and from a position of power, the dominance of the academic group is evident, since they are the source of the actions related to introducing game programming in the course. The effectiveness of teaching using game programming as a *truth claim* can only be attested to in conjunction with claims made by the student group. Thus the following tables present analysis of various statements between these two groups. The analysis is not intended to vilify any particular group, but to help in moving beyond the surface of communicative action that may underlie legitimate action based communicative misrepresentation or distortion.

A basis for analysing the validity of the truth claims is to lay out the issues that occasioned the change in programming delivery using business examples to that employing game programming. One of the overriding claims is that in previous course offerings employing business examples, there was a consistent *high failure and drop – out rate* in the course as well as a realization that computer programming has been traditionally *a difficult course* with noticeable *low student class attendance* ***[ET2]***. In an effort to cure these 'ailments' of the course, the educators concerned decided to make changes in how the course would be delivered by making the claim that gaming makes programming *more interactive, more exciting*

and more fun. Therefore, this assists in making concepts more understandable ***[ET1; ET3]***. On implementation of game programming, the impression the educators got is that the *course became more difficult and challenging* making the course more engaging ***[ET3; Student T1].*** The first issue to address is whether making a course *more interactive, interesting, exciting* and *fun* is a desirable property of learning outcomes. The second issue is whether instructional games provide these properties.

Research has established that instructional computer games directly focus on active learner participation with the purpose of addressing cognitive and affective learning, interactivity and perhaps most critically, motivation for learning (O'Neil, Wainess, & Baker, 2005). The claim is that motivation characteristics of computer games enhance greater engagement of students thus leading to learning (Garris & Ahlers, 2001).

***Table 5*. Truth Claims Analysis**

Empirical Indicators	Interview Excerpts
T1. What is said about the use of games in teaching computer programming?	[…]firstly it is *more interactive*, it is a bit *more fun than a business program* and when students interact with their work that is how they learn, and at least some of the students are enjoying it a lot. It does help to *explain the concepts and help them understand it better* ***[ET1]***. […] my impression at the moment is that by making it actually *more difficult and more challenging* they become more *engaged*, um, for the strong students its nice because they've got a challenge that they can take that's interesting to do. For the not-so-strong students they realise that they really need to work on this ***[ET3]*** […] be *more interesting* for them and *more exciting*, but also it is a bit more of a *real example* because the other examples are very much hypothetical. […] we thought that would make the programming more real for them, especially the object orientated programming because they can see that *object-orientation is very easy*, can be well-explained using gaming and games ***[ET3]***.
T2. Are the issues and options clearly defined?	[…] there was a high dropout rate for this subject and *a high failure rate* and not a lot of people get exam entrance for this subject, there were a lot of problems. Um and so we thought of various ways to change it […]. We realised it is *a difficult subject* so we ex-

	pected the people not to do well but then we realised that the *class attendance was quite low*. Quite often there are students, who rarely come to class, […] and one of the things was to make it interesting; to make it game-based programming **[ET2]**.
T3. What challenges and benefits have been identified and assessed?	I think that the practicals are a lot harder than the work we do in the theory lectures and I struggle to apply my knowledge ***[Student T1]*** […]a lot of my time is spent google-ing how to program instead of programming itself; Struggling to complete practical's due to other tests and assignments ***[Student T2]*** As an Informatics student, […]Game-based learning is also more suited to children trying to learn the alphabets or how to count. If a person is not exposed to games from a young age, they will find game-based learning very challenging and a disadvantage compared to traditional teaching methods. ***[Student T3]***
T4. Are there ideological claims which are unexamined?	The marks for this semester has dropped severely since last year, ***[Student T4]*** […] the main thing we are trying to overcome with the whole informatics degree is trying to take the *technical side, people skills side and business side and marrying them together*. […] business students are very used to other subjects like maybe accounting or business management where there is one right way and one kind of answer to getting to a problem, where even though *programming is very practical and technical - skill kind of mathematical*. […] I don't think the students get a lot of opportunity to experiment in the other subjects with different kinds of solutions ***[ET4]***

What still remains unclear is which game attributes lead to student learning of any kind. Therefore, linking motivation through the use of games to active learner participation is speculative and whether specific learning outcomes are achieved through the use of games remains an open question. While it may be true that teaching computer programming using games is fun, interesting and motivating, they may still remain instructionally useless (O'Neil et al., 2005). This claim is supported by a number of assertions including the general fear by students that marks will generally drop *[Student T4]* even though the assumption is unexamined. In addition, the challenges experienced by students as evidenced in their statements [***Students T1, T2, and T3]*** bring out questions as to whether active learner engagement is being achieved through the use of computer games. The quest for "fun" using computer games

in teaching is also a myth. Bruckman (2009) asked the question "Can Educational be Fun?" over a decade ago using computer games. Her assertions were that computer game designers, in their attempt to make learning less unpleasant, advocate for the use of computer games by adding 'pretty graphics'. However, the problem with such an approach is that learning happens out of context (Bruckman, 2009). The student's views corroborate the view that learning using computer games is out of context for business oriented programming *[Student T3]*.

Legitimacy Claims

In this section, we seek to show the nature of particpation of the various stakeholders involved in introducing game-based teaching in the curriculum. Particularly pertinent is who was not involved in the legitimization of game-based teaching of computer programming. This is vital in delineating stakeholders' agendas which played a role in legitimizing the use of computer games in teaching programming. The overriding legitimization claim is that using computer games to teach programming is likely to improve students' engagement in learning. Some literature supports this assertion. However, who is silent and why? The silent voices must be heard in order to test the claim of legitimacy and discount any notions of illegitimacy of the engaging nature of computer games in teaching programming. To unearth the agendas of those who 'speak' and those who are 'silent', the starting point is to link the stakeholder particpation process to that of curriculum design and review in general.

It is generally accepted that when faced with accountability pressures stemming from inadequate student engagement, high failure rates, high dropout rates, educators tend to change curricula to stem the negative tide. Within a university setting, critical stakeholders in this process are notably the *department* where a particular course is housed, the *faculty*/*instructors* and the students. At the broader macro-level, the concern for the faculty and the department is to avoid a massive failure which is likely to affect student enrolment. At the individual level, the educators are concerned with issues that relate to performance. Whenever there is a high failure rate, there is likely to be a 'red flag' raised by the department and the faculty pointing to the competency of the educator. Of course for the student, their interest is to excel in a course. Thus, from a curriculum design and delivery perspective, the expectation is that the stakeholders form a web of collaboration in order to legitimize the use of computer games without disharmony. Achieving harmony through the web of collaboration entrenches the legitimacy of the process in order to realize meaningful and acceptable change. Empirical observations indicate that this may not have been achieved before engaging in the process.

One of the legitimization reasons given for the preference for using computer games is that the current generation of young students frequently use games socially and therefore computer games can naturally be used for learning. We surveyed 77 informatics students who were taking the computer programming course to find out how frequently they play computer games. Only 10% indicated that they played computer games daily, while 48% played every week and another 23% do not play games at all. All the respondents surveyed and interviewed were below the age of 25 and the assumption that the age group are avid users of computer games is not really supported. Therefore, when computer games are introduced as a teaching tool to business students, the empirical indicators imply that it may not be the interests of the students that are being considered. The introduction and use of computer games in teaching could be an attempt to respond to accountability pressures and the influence of other stakeholders (i.e., accrediting bodies, government & university officials, Deans, Chairs) and modify the curriculum to respond to these influences and pressures.

After the implementation of curriculum change, 45% of the students surveyed actually agreed that using computer games improved their problem solving ability taking into account that the same learners had taken an earlier programming course; while 25% disagreed. In addition, 58% of the students agree that computer games are relevant in imparting programming skills in general and that these games aid in exploring learning outcomes beyond the boundaries set by the instructors (52%). However, when other conflictual observations are taken into account, then this observation pales in legitimizing using of computer games. Is the overall legitimization claims for the use of computer games in teaching business programming compelling? This remains unclear because of conflicting data. For instance, one of the legitimization claims by the educators is that using computer games would improve lesson sequencing week-by-week as new concepts that are introduced build on earlier concepts. The survey data reveal that only 28% of the students feel that lesson sequencing was improved, while 72% indicated that using computer games did not improve the sequencing of lesson delivery in order to improve learning. As long as there remains conflicting results, the veracity of the legitimization claims for using computer games in teaching business programming remain questionable.

Sincerity Claims

What should become apparent in the analysis of sincerity claims is the congruency between utterances and what is meant by those utterances to avoid any false assurances. The

hearer or the reader of the utterances should be able to trust that what is said is actually meant by the speaker. In this section, we analyse the sincerity claims by assessing the nature of congruency between what is said and what is meant by uncovering how the speakers are using *hyperbole*, *imagery* and *metaphor* to reinforce their positions regarding the effectiveness of computer games in engaging students. The stakeholder groups of interest are the *student perspectives* and the *educators' perspectives*. We do recognize that there are other stakeholders involved in ensuring effective delivery of university courses as was pointed out earlier. However, from a technical standpoint, the implementation of effective course delivery rests with the educators and the students. Table 6 captures these views and are analyzed in the following narratives.

***Table 6*. Sincerity Claims Analysis**

Empirical Indicators	Interview Excerpts
S1. Do metaphors and connotative words promote or suppress understanding? S2. Do metaphors and connotative words create false assurances?	"[…] ***I don't think that it is easier using games*** because some of the concepts are much are much more intense and much more difficult than in business programming. I think the advantage of games is that it is easier to understand what you are doing because you can actually visualise in the game what a class is you can assign a class to be an object in a game" ***[ES1]***. "The marks for this semester has dropped severely since last year, ***I experience difficulty*** in knowing precisely what is wanted and the explanations in the practical assignment could be more descriptive" ***[Student S1]*** "The fact that we stick to the game concept that has begun to just get on my nerves as it has ***no application to business systems design at all***. There are no helpful tutorials for any of the advanced concepts on the web or anywhere else" ***[Student S2]*** "[…]but also its a bit more of a real example because the other examples are very much hypothetical and you've got some kind of business scenario and then you're selling something and you have students with marks which is sometimes quite hypothetical for their students" [..]but what we have found in other subjects as well is that a lot of the students don't actually understand business, even though they are business students, they

	don't really understand business, um so that's why we thought let's try something a little bit different ***[ES2]***.

One of the dominant metaphors with a high level of congruency related to the increased 'difficulty' of the course when computer games was introduced as a mode of engaging students in teaching business programming. This was not only noticeable when individual students statements are analyzed (*Students S1 & S2*), but also statements attributable to the educators who are currently involved in implementing the game-based approach **(*ES1*).** Further, when a survey of 40 students was undertaken to assess whether the use of computer games increased the level of difficulty of the course, 85% indicated that the course is more difficult. When a student states that the, *"marks for this semester has dropped severely since last year (Student S1),* despite their lack of evidence to support such a claim, the frustration needs to be understood in light of the perception of increased difficulty of the course. If one of the truth claims highlighted earlier was to position computer games as a better tool for redressing the problem of high dropout rates in the course, then the perception of increased difficulty of the course is likely to create a *negative imagery* in solving this problem. It is also presumed by the educators that the programming background of the students prepares them for the business programming course. For instance, a survey of the Informatics students indicated that 90% already possessed graphical user interface (GUI) programming capability; 70% can create and manipulate variables; 87% can understand control structures and loops after revising while 85% understand one-dimensional and parallel arrays after revising. Therefore, while congruency is achieved in labelling the course more difficult and challenging, the attainment of congruency does not aid the desired course of action in positioning computer games to be more effective as a learning tool compared to using business case studies.

Lack of congruency is more evident when a student (S2) makes the claim that computer games have, '*no application to business systems design at all'* are compared to an educator *[ES2]*, claiming that computer games used in teaching business programming offer, "*a bit more of a real example because the other examples are very much hypothetical of business scenarios*". This presents a dichotomy of opinions of the two stakeholder groups, and points to *incongruence* and possibly to some false assurances on the part of one of the stakeholder groups. This may allow us to make the claim that incongruence lends credence and support to

the possibility that illegitimacy claims were actually at play. This then brings the course of action, assumed to be an outcome of some form of communicative action, into disrepute. We also see other powerful associations in how language is employed to reinforce the nature of incongruence in other statements shown in table 5.

Conclusions

The argumentation and the analysis that has provided traction for this paper is grounded on action research and critical theory perspectives. From an action research perspective, it behoves researchers involved in implementing curriculum change to engage in reflexive behaviour (i.e., the need for stakeholders in curriculum design to continually think about and evaluate experiences to reach new understandings or perspectives (Boud et al., 1985)). From a critical theory perspective, we must resort to a course of action that is emancipatory to the social problem we seek to redress, for instance by experimenting with various teaching approaches in order to better engage students.

We make two concluding remarks linked to the epistemological perspective of reflexivity reified by an action research approach. The first is a consequence of adopting an action research perspective and the outcomes of the prior analyses. From a reflexive point of view, the prior discourse analyses have revealed that the approach to redressing the problem of improving the teaching of computer programming to business students using games is a flawed process because of the 1) obfuscation of the rationale for comprehensibility claims was dominant, 2) the truth claims revealed misrepresentation of facts, 3) the web of stakeholders revealed conflictual undertones in their legitimization claims and 4) while there were also false assurance in sincerity claims resulting in incongruence in intentions. We see these outcomes as having important implications for academic teaching practice. The first implication to teaching innovation is linked to the broader *reflexive practice of experimentation* which is connected to empowerment (Barge, 2004). That is, from a curriculum implementation and management perspective, when educators act reflexively, they will feel freer to experiment without undue concern of making incorrect decisions. We posit that freer experimentation in curriculum implementation in different disciplines can allow educators to assess the pragmatic utility of various alternatives and should be encouraged in institutions of higher learning. The exploration highlighted in this study has highlighted how the educators experimented with a teaching approach whose validity claims ‘they’ believed in. However, the subsequent ‘refutations’ of the claims after action implementation allows the educators to seek

other alternatives. Thus the educators, through self – reflection, become learners as they reflect on their actions in the quest for emancipation. Boud and Walker (1990) emphasize the critical role that reflection plays in the process of learning, necessary for emancipatory action. We therefore advocate for reflexive practice as inevitable in academic practice since where reflective behaviour is absent, poor decisions and judgements are likely to lead to teaching approaches unresponsive to student situations.

The second implication arising out of undertaking an action research agenda is that reflexive practice espouses inclusive, respectful and safe communication environment that fosters feedback (Barge, 2004). In the analyses reported in this paper, what emerges from the responses is that context for exchange of dialog between the students and the educators resulted in open feedback regarding the issue of using games in teaching computer programming. We see this as important, especially when it is considered that educators typically have a dominant space when interacting with students. Thus the expectation from this research project would have been a subdued students' 'voice'. This was not the case in this study, and the 'weak' voices of students enabled a change in practice. The claim that can be linked to the reflexive ability to foster feedback in a communicative process is connected to the notion of 'reflexive competence', i.e., the fact that we (as researchers and the research participants) were able to develop "properties and powers to monitor the 'life' of the course which has assisted us in a possible reproduction and transformation of the course. Therefore, encouraging an environment for feedback can help educators develop reflexive competence, which should be a desired property for transformation of curricula. When the concept of reflexive competence is linked to our daily work as educators, we are stirred to constantly question the routine activities we engage in such as revisiting programming curricula periodically rather than continuously, long held beliefs about the relevance of computer programming for business students which may be based on a computer science logic or assumptions that student feedback could be irrelevant in curriculum design.

This study, approached from the philosophical assumptions of Critical Theory, can be linked to the attainment of emancipation from the dominant computer science logic that learning computer programming can be enhanced by using games (Al-Bow *et al*., 2009; Long, 2007, Klawe, 1994, Ricci, 1994), yet for business students, the context presented in a game environment is irrelevant from the empirical results. Critical theory also links emancipation to appropriate action to change things for the better. This agenda has been attained through

the action research approach adopted and the implications linked to the idea of reflexivity addressed in the paragraphs above. Overall, we as researchers need to consider how the outcomes of our research project will improve the current situation for change to occur. This requires that we re-consider the constraining conditions that continue to hamper constructive discourses that can encourage proactive and emancipatory curriculum design and redesign even as academics are constantly faced with accountability measures that sometimes inhibit experimentation. We argue that attaining emancipatory aims does not necessarily imply the creation of a different artifact (physical or conceptual), but may denote a change in how we think about assumptions in actions that we take to guide action. As educators, this is emancipatory in itself. For instance, the dominance of literature that recommend the use of computer games is almost taken for granted in our information systems community, yet the disharmony amongst the key stakeholders seems to contradict the literature. Thus better reflection on our part as educators involved in teaching computer programming courses will help us in creating a communicative space in which dialogical discourse results in transformation.

Future Research Directions and Limitations of the Study

A number of studies have looked into the relevance of using computer games programming, software development and other computing concepts. However, what emerges from these studies appears to support the use of computer games, yet our study contradicts such outcomes. Future research should entail looking at the use of computer games in teaching programming from a critical perspective, by for instance considering the relevance of games to the future work context of students. We consider context to be directly linked to the student's major (whether Computer Science, Engineering, Information Systems, etc.) which have different foundational cores and logic. Thus the universal elevation of the effectiveness and relevance of computer games across disciplines (and contexts) is fallacious and requires a critical scrutiny.

We make no emphatic claim that using computer games in teaching business programming as completely irrelevant, but call for further research. Our claim, in a preliminary sense, can be linked to the critical theory perspective that was adopted, which may have influenced the research to seek out only those stakeholders (students) whose voices are assumed to be subdued in a curriculum design process. However, we did not delve deeper into the concerns of other stakeholders that play a critical role in the Information Systems disciplines, notably the industry (as employers and sponsors), the government, the university administra-

tors and even parents. This limitation also presents an opportunity to broaden the participant base for future research. We also point out the limitation that is linked to how we obtained some of the data, i.e. via student self-reporting. There are numerous issues related to using self-reported data, such as the respondent's possible inability to provide an accurate self-assessment and also provide socially-desirable response patterns. To offset such limitations, future research should consider using other relevant data sources such as surveys of students who are already employed and were taught using computer games. Such triangulation can strengthen the inferences made based on this research.

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