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Scoping Social Presence and Social Context Cues to Support Knowledge Construction in an ICT Rich Environment.

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The purpose of this paper is to capture and bracket the learning experiences of 164 first year students as they make the transition from a conventional face-to-face setting to an Information and Communication Technology (ICT) enhanced learning environment. Where this kind of learner transition was once considered novel and worthy of 'examination' in its own right, it is now a commonplace experience (albeit non-trivial). The aim of this paper is to refocus the 'New Learning Technologies' discussion on aspects of learning, in particular to critically examine social presence in the face-to-face and online learning environment and how this is linked to processes of knowledge construction.

Dimensions of social presence are defined and examined, and indices are assigned to both face-to-face as well as online learning episodes for purposes of comparison. Three dimensions of social presence—social context, communication, and interactivity—emerged as important elements in the processes of knowledge construction in both an ICT and face-to-face setting. Findings indicate an increase in the level of online interaction occurs with an improved level of social presence, a phenomenon most exhibited by female participants. While comparisons between face-to-face and ICT supported learning episodes can be used to inform all aspects of our teaching, the paper concludes that knowledge construction in an ICT setting can be enhanced by considering learner characteristics, by selecting the appropriate ICT-mediated communication medium, and by applying appropriate instructional elements to course design.

About Knowledge Construction

After a recent reading of Cilauro, Gleisner and Sitch's travel guide spoof "*Molvania – A Land Untouched by Modern Dentistry*" I was struck by the 'fictional realism' of the travel genre and its capacity to invoke a reaction in the reader. Picking it up from my desk for a quick browse, a colleague remarked on my interesting choice of conference destinations, and fielded questions on how far south of Latvia the Moldavian capital was located. Not wanting to be drawn, I told him it was a fictional country ... this was not the real lonely planet ... in fact the whole "Travel Guide" was an elaborate fiction, but given the clever textual device a seemingly 'real fiction' at that. Notwithstanding the obvious (the Molvanian tri-colour flag comprises only two colours; Molvanians love eating out – preferably in France or Germany; the blood alcohol limit for drivers is 0.12 and 0.15 on weekends - though both are inadmissible in court) the reader soon realises the crafted and comic quality of the text, and the generic attributes (context, mode and interaction) that enable it to work (simultaneously) as both a comic and travel fiction. It is these qualities I wish to elaborate in terms of teaching and learning.

Like the travel guide to Molvania, ICT enhanced teaching and learning is often treated as a parody, compromise or adaptation of 'real-life' face-to-face (read proper) tertiary teaching; yet it retains the characteristics (and promise) of the original. In this way, the ICT learning environment suffers as an incomplete science; face-to-face learning continues to act as the 'edge' that defines 'what counts as learning' in higher education. In my own teaching practice, I have continuously tried to experiment with learning in a way that blends both learning technologies and learning approaches – that is variations in context, mode and interaction. In particular my focus has moved away from an earlier fascination with how we could use technology for learning, towards a more recent preoccupation with how we can learn through technology. This shift has involved applications and iterations of the following principles:

- (a) *Contextualised learning* (Lave & Wenger, 1991): That outcome based learning needs to be provided within an academic study program and enacted by the lecturer who has designed the course and who will assess the learner's performance. In essence, learning that has an identifiable social presence.
- (b) *Practitioner-based learning* (Ausubel, 1985; Novak, 1998): Learners are actively engaged in constructing knowledge for application within a given context of practice. In essence, learning that is contextually cued.
- (c) *Deep (reflective) learning* (Marton & Säljö, 1997): Teaching and learning activities should facilitate reflective episodes that support deeper learning and that link to practice through reflective engagement. In essence, learning that is interactive.
- (d) *Goal-oriented learning* (Evans, 1991): Learning should serve the purpose of apprenticing students into emerging discourses and communities of practice. In doing so, learning ought to describe, explain, justify and improve practice. In essence, this is a type of learning that is learner-centred.

Knowledge construction, Social Presence and the Learner

Conceptually and theoretically, my concept of curriculum is based on the premise that learning is *knowledge construction*. It involves both the *storing and structuring* of knowledge and the structuring and construction *process* (Resnick, 1987). In the Molvanian Travel Guide (pg 78) the "**Watch Out**" traveller Segment warning stands out:

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Due to erratic water pressure, guests in Vajana's top hotels are warned against using the bidets (*freklijsqirtz*). As one recent visitor pointed out, "There's a fine line between personal hygiene and colonic irrigation."

Despite the sheer comic value, the (social) context and authenticity of the 'warning' is established, accepted, and seen to be consistent with the genre. It invites both knowledge storing and processing within established network clusters; the humour derives from juxtaposition with pre-existing 'travel warning schemata' in a post SARS, post Bali community of travellers. We construe this to be a farcical account - knowledge construction hinges mainly on an *understanding* of the *relationships* between different components of knowledge; understanding is demonstrated in the ability to interpret, integrate and create new knowledge (Resnick, 1987) actively, purposefully, effectively, and strategically. When mediating text, from a constructivist viewpoint the learner has to do the thinking, relating, constructing, integrating and interpretation Knowledge is, after all, personally constructed (Toohey, 1999, p. 56). However, the teacher needs to make the learning platform available; they must explicate its dimensions and processes, and provide the scaffolding for thinking and constructing to take place purposefully and effectively. Teaching and learning thus have a context of practice.

To this end, Anderson (1995) describes different types of knowledge. Declarative (also known as representational or propositional) knowledge (Anderson, 1995) is knowledge about facts, beliefs, things, and events usually expressed as theories, principles, rules, and frameworks (knowing what). When this theoretical knowledge is converted into action, it becomes procedural knowledge (Anderson, 1995), realised as the skills and techniques related to *knowing how* to perform cognitive tasks. When both the theoretical (propositional) and practical (procedural) knowledge are enacted, it becomes conditional knowledge - that is knowing *when, where, and how* (Paris, Lipson & Wixson, 1983) cognitive tasks are to be performed and applied. When the theoretical (propositional), practical (procedural), and applied (conditional) knowledge are used as deliberate learning strategies, *strategic knowledge* (Taylor, 1991) comes into being, meaning the learner is negotiating the when, where, how, and why of learning.

There is a clear (directional) taxonomy between these four categories of knowledge, arriving at a fifth knowledge type that Anderson (1995) and Biggs and Moore (1993) describe as metacognition – the *learning about learning*. The mediating factor in this taxonomy is social presence. Informed by what Biggs (1999) would describe as the constructive alignment between pedagogic objective, curriculum design, teaching methods and strategies, assessment methods and criteria, social presence refers to the degree to which people establish productive connections with each other through communication in a learning setting (Short, Williams, and Christie 1976). It is related to the degree of salience attached to others involved in learning interactions. A high social presence is supported by the processes of constructive curricula alignment.

In what can be described as a tension reduction hypothesis, the minimum level of social presence occurs when a learner has a sensory experience that indicates the presence of another. Factors that contribute to the degree of social presence in traditional face to face learning episodes include facial expression, the (Foucauldian) gaze, posturing, dress, nonverbal cues, and vocal cues. Perception of social presence, initially seen as an attribute of communication media (Short et al, 1976), varies among users (Gunawardena 1995) and is seen as a subjective measure based upon interpretation and perception of a learning experience. Short, Williams, and Christie (1976) regard

social presence as the most important perception that occurs in a learning environment, seeing it as fundamental to person-to-person communication, and therefore learning experience. Social presence offers a rich heuristic (at worst a euphemism) for exploring what works in teaching and learning, particularly with regard to those aspects of face-to-face and ICT mediated learning that attract high social presence cues, and which are therefore more likely to support the knowledge construction processes of the learner.

How Does Social Presence Work as a Structuring Resource for Learning?

The degree of social presence in a learning exchange is based on the characteristics of the learning medium and the user's perception; it is not therefore media bound. It is the interplay between immediacy and intimacy (Figure One); immediacy and intimacy are determined by social context cues; learning interactions frame learning relations, and patterns of communication in turn feed (and form) social context cues. Each is linked, and interlinked. Immediacy refers to the psychological distance between a communicator and the recipient of communications, conveyed through speech and associated verbal, textual, nonverbal and other cues. Immediacy effects relate positively to a number of knowledge construction processes. Intimacy effects refer to member perceptions of social context cues such as eye contact, proximity, personal space and demeanour. When an uncomfortable degree of intimacy is encountered, members will attempt to alter their behaviour to maintain an optimal comfort level, called equilibrium (Short et al, 1976). The documented phenomenon of social presence as a structuring resource was described initially in face-to-face, audio, and closed-circuit television encounters. However, the ICT-mediated learning environment presents very different characteristics from these, and the face-to-face classroom.

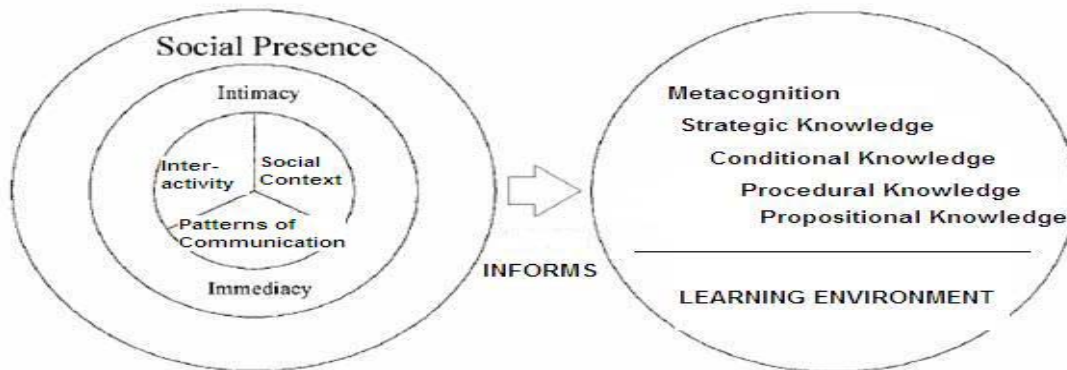


Figure One: Social Presence and Knowledge Construction

In the face-to-face classroom, higher social presence is seen to support the processes of knowledge construction (Sproull & Kiesler, 1986). As a low presence, and low cue media, social presence theory pre-empted that the ICT environment will be 'challenged' in efforts to facilitate the 'development of strategic learning' in students. Sproull and Kiesler (1986) extend this contention to include social context cues, which serve as indicators of appropriate 'contextualised' behaviour. Social context cues in a face to face classroom govern the norms and practices of contact, social desirability, conversational turn taking, standards of disclosure, and a host of situational and context variables. However, social context cues are embedded in nonverbal communications. Given the

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absence of nonverbal cues in an ICT setting, it follows that where ICTs are involved we are less able to make subtle differentiations among communication stimuli, and therefore less able to exert control over our selves in order to meet group expectations and to perform important group roles. As Sproull and Kiesler (1986) contend, this is more likely to lead to role-ambiguity, increased anonymity, reduced self-regulation, and reduced self-awareness.

This raises compelling questions for those of us who teach in an ICT-mediated setting, each of which will be taken up in this discussion.

1. How can we inoculate the ICT enhanced learning environment against the claims and consequences of low social presence?
2. How does the ICT setting compare to the traditional face-to-face setting in comparing the social presence of learning interactions?
3. Is it possible to assign social presence indices to both face-to-face and ICT settings for purposes of comparison?
4. Given 1,2 & 3, What would constitute a best learning systems model?

Data Capture

The featured program of study served as the students' introduction to education, and also provided the 'learning frame' for the students' professional experience (teaching practical) program. Each student participated in the three learning stages of the program described below; stages one (f-2-f) and two (online) were heavily prescribed (fixed and obligatory) whereas stage three required students to 'blend' f-2-f and ICT enhanced learning to a mix a 'learning cocktail' of their own choosing.

- *Stage one of the program featured face-to-face teaching in a lecture and tutorial mode of delivery. Students were also organised into semi-autonomous study (learning circle) groups engaged in learning activities outside of class-time on a weekly basis.*
- *Stage two of the program featured an online study component, comprising only online lectures, tutorials as well as online study groups. A proprietary Learning Management System (Blackboard) supported GroupWare technologies that enabled easy transition between private and public learning spaces, shifting the learning focus from the macro (class) level to the micro (learning circle) level. E-mail provided a conduit for one-on-one networking for the sharing of information with limited clusters of people, and 'back channel' group discussion pages helped orchestrate private learning spaces before students entered public fora for group work and/or learning.*
- *Stage three of the program featured a blended approach (f-2-f as well as ICT enhanced) to the learning program. Students were given access to multiple modes of delivery as part of a broad learning architecture.*

The purpose of this curriculum exercise was to build a learning environment that enables users to explore the how knowledge construction and social presence interact in f-2-f and ICT enhanced learning environments. More specifically, its aim was to explicate the relationships described in student perceptions of social presence in ICT enhanced and f-2-f learning, students' self-perceptions of their learning and their satisfaction with their

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overall learning experience. At each stage (1, 2 & 3) of the program, students were asked to complete a survey instrument (adopted from Gunawardena & Zittle, 1997) consisting of indicator statements related to social presence for each of the nine learning events (table 1 below) they engaged.

Lectures	<i>Students were asked to rate online and f-2-f subject lectures and reading assignments as part of their learning experience.</i>
Tutorial Exercises	<i>Students were asked to rate online and f-2-f tutorial assignments and tutorial activities.</i>
Group Work Content	<i>Students were asked to rate how they had progressed the content of their group work project (task and materials) in both online and f-2-face settings.</i>
Group Work Processes	<i>Students were asked to rate how they had progressed their group work processes (project roles and goals) management in both online and f-2-f settings</i>
Examinations/ Quizzes	<i>Students were asked to rate formative f-2-f and weekly content-based Online E-Quizzes. These were each linked to the final examination in the subject; i.e. the final exam comprised a random selection of e-quiz and tutorial quiz items.</i>
Interpersonal Exchanges	<i>Students were asked to rate how f-2-f and online communication episodes and exchanges supported their learning.</i>
Academic Writing Skills Development	<i>In the f-2-f setting the traditional essay dominated, while in the ICT setting students engaged in the process of e-publishing (position paper), peer review and peer-marking.</i>
Learning Self-management	<i>Students were asked to rate how each learning (f-2-f and ICT) setting impacted on the self-management of their learning process.</i>
Academic Reading Practices	<i>Students were asked to rate the impact of online and f-2-f teaching practices on their academic reading proficiency. In the f-2-f mode, traditional books of readings were relied upon; in the ICT setting, virtual libraries and e-readings predominate.</i>

Table One: Learning Events Featured in the current study

In short, students were asked to assign a social presence index (rating 1-5) for each of the above communication and learning events. For each of these learning events students were asked to indicate the degree to which they either agreed or disagreed with each indicator statement using a five-point Likert-scale (1=strongly disagree to 5=strongly agree). Across group means were calculated, as were item average means for male (n= 61) and female (n=103) students. Data presented here includes *Paired Sample t Tests* for differences between the ICT-enhanced and face-to-face experiences of male and female students.

Discussion – Discrete Learning Indices

The fact that it was possible to replace nine face-to-face learning activities with nine ICT enhanced learning activities in a single program of study is evidence of the degree to which ICTs can be integrated into pre-service teacher education through the agency of a learning management system (LMS) and a host of online 'learning resources'. At risk here though, is the fabric of 'critical' education and the spirit of active learner participation (Blasi & Heinecke 2000, p83) as learning crosses boundaries from one communication medium (face-to-face) to another (ICT). On top of this, as Lambeir (2002, p113) points out, ICTs seem to "feed of the limitations teachers often have to face" in the process of teaching. The emphases placed on time management, class management

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and efficiency, individualisation and autonomy, information processing and problem solving in an ICT environment can promote a pedagogy that at times diminishes the 'social presence' of the teacher, and can also work to pigeon-hole the learning response of participating students.

Scale Item	Mode & Sample (M)ean		Average Item Mean		Difference
	Mode	Mean	Male	Female	t
Lecture	Online	(M =3.99)	3.80	4.02	-2.11*
	F-2-F	(M =4.23)	4.04	4.34	-3.16*
Tutorials (x=	Online	(M= 3.69)	3.50	3.80	-2.73*
	F-2-F	(M= 3.22)	3.17	3.25	-0.63
Exams & Quizzes	Online	(M = 4.11)	3.97	4.19	-1.98
	F-2-F	(M = 3.79)	3.64	3.89	-2.20*
Interpersonal Exchanges	Online	(M = 4.10)	3.84	4.26	-3.41*
	F-2-F	(M = 4.34)	4.07	4.57	-4.97*
Academic Writing	Online	(M = 2.84)	2.93	2.79	0.49
	F-2-F	(M = 3.30)	3.34	3.27	1.12
Academic Reading	Online	(M = 3.81)	3.66	3.90	-1.51
	F-2-F	(M = 3.40)	3.34	3.44	-0.90
Learning Self-Management	Online	(M = 4.43)	4.24	4.54	-2.59*
	F-2-F	(M = 4.03)	3.85	4.14	-2.26*
Group Work Content	Online	(M = 4.06)	4.27	3.94	-1.28
	F-2-F	(M = 4.28)	3.81	4.56	-3.60*
Group Work Process	Online	(M = 3.47)	3.23	3.62	-2.74*
	F-2-F	(M = 2.89)	2.89	2.89	0.05

Table Two: Average Item Mean & t Test Measures for Male/Female Differences in Social Presence ratings within structured f-2-f and online learning events.

* = significance at $p < 0.05$

ICT & f-2-f settings as measures of social presence.

Data here (Table Two) reflects some interesting trends in terms of student perceptions of 'social presence' across each of the learning events examined. Respondents identify higher social presence in the f-2-f setting relative to lectures, structured f-2-f interpersonal exchanges to support learning, f-2-f academic writing workshops and f-2-f group work activities. In the online environment, respondents assign a higher relative social presence value to e-tutorials, e-quizzes and exams, academic reading activities, learning self-management, as well as the management of e-group work processes. This pattern of discrimination between f-2-f and online contexts narrates a deeper split between the 'public and private' knowledge making processes of the learner; the architecture of f-2-f interactions better supports what Anderson (1995) describes as the situated-construction of *declarative* and *procedural* knowledges; the online setting seems to support deeper *conditional* (Paris, Lipson & Wixson, 1983) and more personal *strategic* (Taylor, 1991) knowledge construction processes. Given the data, the learning (knowledge construction) relations between f-2-f and online learning events are

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taxonomic, in so far as each works as a structuring resource for the other. We elaborate these connections further.

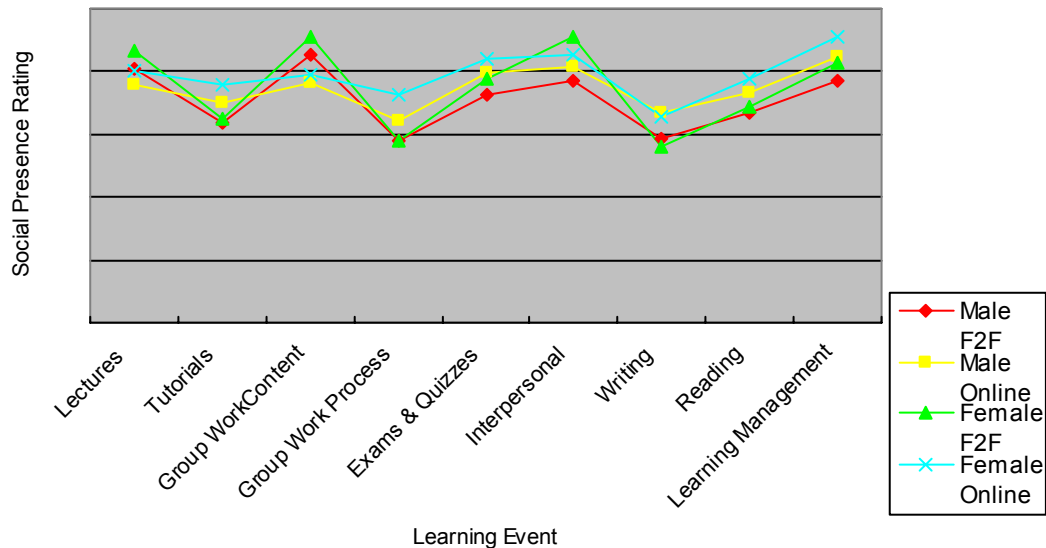
Declarative (also known as propositional) knowledge (Anderson, 1995) is 'public' knowledge about facts, beliefs, things, and events usually expressed as the theories, principles, rules, and frameworks (*knowing what*) that form the very 'stuff' of lectures and tutorials. Students assign a high social presence value to both f-2-f (M=4.04) and online lectures (M= 3.99), with a preference for the former. This theoretical knowledge is converted into action through participation in tutorials, learning groups and workshops geared to academic and cognitive skills development. At this stage it becomes what Anderson (1995) terms 'procedural' knowledge, which is realised as the skills and techniques related to *knowing how* to perform specific cognitive tasks (such as academic reading/writing and group role/goal formations). Again students assign higher social presence to f-2-f learning groups and workshops, with a clear preference for f-2-f group work over its online counterpart as the preferred means of 'doing group work'. What counts as propositional and procedural knowledge (Anderson, 1995) is given greater expression in the f-2-f situated setting, reflected in higher relative social presence indices for certain f-2-f learning events (Table Two). Here is where the data becomes more interesting.

Anderson (1995) contends that when both theoretical (propositional) and practical (procedural) knowledges are enacted, conditional knowledge is derived, meaning the learner knows *when, where, and how* (Paris, Lipson & Wixson, 1983) cognitive tasks are to be performed and applied. This kind of knowledge is critical to pre-service teacher education. Further, where the theoretical (propositional), practical (procedural), and applied (conditional) knowledge are used as deliberate learning strategies in f-2-f or online settings, *strategic knowledge* is the resultant outcome (Taylor, 1991). This means the learner is actively negotiating the *when, where, how, and why* of learning. Respondent ratings assign a higher relative social presence value to the online setting in terms of organising and structuring learning (e-tutorials and learning management), situating learning and feedback immediacy (e-quizzes & e-exams as well as facilitating academic reading), and as a capacity management tool set (management of group work processes). Taken together, these measures endorse the online setting as a preferred mediator of conditional and strategic learning events.

Some Gender Perspectives

In cross sample comparisons, in all but one of the nine listed learning events (academic writing) female students assign higher relative social presence ratings to both online and f-2-f learning events than their male counterparts (*these differences in the perceptions are presented graphically in Figure 1*). The results indicate that in terms of ICT and f-2-f learning activity comparisons, female (M=4.02) and male (M=3.99) students are more likely to prefer f-2-f lectures, with male students assigning significantly less social presence value to f-2-f ($t=-2.11$, $df=162$, $p<0.05$) as well as online ($t=-3.16$, $df=162$, $p<0.05$) lectures than female students. The same trend can be seen in patterns of interpersonal exchange; in the f-2-f ($t=-4.97$, $df=162$, $p<0.05$) and online ($t=-3.41$, $df=162$, $p<0.05$) settings, male students placed less 'learning' value on interpersonal exchanges than their female counterparts.

Figure Two: Learning Activities Ratings F2F and Online by Gender



Both male and female respondents rate the process of f-2-f group work the same ($M=2.89$), yet differ significantly in their perceptions of group work processes in the online setting, with male students much more circumspect about the role of ICTs in facilitating group work processes ($t=-2.47, df=162, p<0.05$). Male students present clear preferences for f-2-f group work events, but not in a tutorial setting where applied learning exercises (conditional learning, Paris *et al*, 1983) were the focus of tutorial tasks and activities. Online tutorials are assigned comparatively higher social presence values by male ($M=3.50$) and female ($M=3.80$) respondents than f-2-f tutorials, but again male respondents assigned a significantly lower social presence weighting and preference ($t=-2.11, df=162, p<0.05$) for online tutorials than female students. Similarly, male students also reported significantly less social presence value for f-2-f exams and quizzes ($t=-2.20, df=162, p<0.05$). Interestingly, no significant gender differences were reported into preferences for online quizzes and exams, due in part perhaps to the fact that respondents placed high social presence value on the web-mounted quiz engines that provide learner flexibility and immediacy through continuous feedback cycles, thus supporting what Taylor (1991) would term the construction of 'strategic knowledge'.

In relation to learning self-management, both male and female respondents assigned a higher relative social presence value to ICTs (sample mean, $M=4.43$) as a learning management framework, with female respondents reporting significantly higher social presence ratings for both f-2-f ($t= -2.26, df=162, p<0.05$) as well as ICT settings ($t=-2.59, df=162, p<0.05$). The across group preference for ICTs as a learning management frame supports Lambeir's (2002) conception of ICTs as emphasizing 'time management, class management and efficiency, individualization and autonomy, information processing and problem'. To some degree, in a climate of growing teacher accountability, increased standardization and greater emphasis on quality assurance (graduate qualities, outcomes, experiences and accreditation) a perceived improvement in the management of learning is a targeted 'deliverable'. As an aside to this, male students also report online group work ($M=4.27$) as having a higher (but not significantly so) social presence value than its f-2-f counterpart ($M=3.85$), while female respondents report a significant

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preference for f-2-f group work as the preferred environment for 'doing group work' ($t=3.60$, $df=162$, $p<0.05$).

Effect differences reported here indicate that attributions of social presence point to clear and very discernable differences in the 'learning choices' and 'patterns' of male and female respondents. By proxy, different learning patterns also point to substantial differences in the when, where, how and why of knowledge construction for different groups of learners engaged in a common program of study. This preference for differentiation and the capacity of the ICT supported environment to meet and extend this preference at the learning interface suggests that further research is needed to enable a full and comprehensive understanding of how a multimodal learning environment engages the deeper knowledge construction processes of the learner.

Conclusion – Towards a Judicious Blending of Approaches

This paper has presented a comparison of traditional f-2-f learning events in a pre-service teacher education program with an ICT enhanced iteration of the same, drawing on measures of social presence to provide the constructs for comparison. In doing so, we have shown that the claims and consequences of low social presence do not affect the ICT enhanced environment alone, but can be equally a product of f-2-f environments. In this sense, ICT mediated learning has shown to have a higher social presence than some comparable f-2-f learning events (e-tutorials, e-quizzes and exams, academic reading activities, learning self-management, as well as the management of e-group work processes); the same is also true in reverse for some aspects of the f-2-f learning environment (lectures, structured interpersonal exchanges, academic writing workshops and f-2-f group work activities). Hence a strong warrant can be argued for a 'blended approach' to teaching and learning that borrows on the strengths of both ICT and f-2-f modes of delivery.

In this regard, this data presented here goes beyond surface level enquiries about the efficacies and benefits of ICTs in higher education; it is no longer a case of do ICTs add value to higher education, but more a case of when, where, how and why they best interact with the knowledge construction processes of learners to facilitate a comprehensive learning experience. In considering what happens 'to learning' when we teach differently, this paper has shown that it is productive to assign social presence indices to both f-2-f and online learning events, and through this assignment move towards a best learning systems model that informs curriculum decisions about when, where, how and why ICTs add learning value.

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