

Gender and Learning in the Design Studio

Ayona Datta: London School of Economics, UK

Abstract

This study examines the gender based learning issues of architectural education in a second year undergraduate architecture studio. It focuses on students' learning dispositions, attitudes to, and perceptions of learning in the studio, their interpersonal relations with the tutors, and their learning motivations. By examining these issues, this study highlights that gender differences do exist in certain studio environments, and provides suggestions for change that would make learning in the studio more inclusive for all students.

Keywords: Learning Styles, Gender Issues, Design Studio, Architectural Pedagogy

Introduction

Student learning issues are currently at the forefront of architectural education. Learning has been suggested as a process of knowledge construction, which takes place through active engagement, participation, and collaboration between learners and educators. Many models of learning exist within mainstream educational literature of which experiential learning, student autonomy in learning, and self-directed learning are a few (Fry *et al.*, 1999) that are critical to architectural education. There are different levels of learning with deep and surface learning understood as two ends of the scale. Deep learning reflects the development of critical thinking and personal development among learners, while surface learning reflects the mere acquisition of knowledge and skills. It is always the aim of educators to create conditions where deep learning can take place.

There are various theories of experiential learning but perhaps the most popular theory is Kolb's (1984) learning styles which identify four different types of abilities to make learning successful: concrete experience, reflective observation, abstract conceptualisation, and active experimentation. In Kolb's experiential learning theory, learners use a combination of experiencing, reflecting, thinking, and acting represented by these four abilities to develop as mature learners. Kolb suggests that each learner has a unique combination of these four abilities that reflect preference for some modes of learning over others. Kolb's system of classification is significant because this has been used by later educational psychologists to theorise and develop tools such as the Learning Combination Inventory Index (Johnston, 1996) to measure learning combinations. Understanding learning styles is important because research shows that when teaching accommodates these styles, then deep learning is facilitated.

Vygotsky (1978) suggests that learning styles are also gender, culture, and discipline specific and are both the product and process of socio-cultural learning environments. The experience of learning reflects aspects of difference between students and tutors as well as among students. Hence although each student must learn certain skills, she/he will always approach this learning from their own socio-cultural position, past experience, their perceptions of their social world, and their aspirations. These factors shape each student's unique learning experience and their approaches to the design problem. Hence each student has his/her unique learning needs which have to be met sufficiently well for him/her to succeed. While students need to identify their own learning needs, it is also the responsibility of the university to recognise these needs and make provisions to meet them (Hodgkinson, 1994). In this paper, I am interested in how the 'socio-educational context' (Ahrentzen and Anthony, 1993) influences learning, motivation and attitudes amongst male and female learners in architecture.

Learning in the Architecture Studio

In architectural education, active learning takes place when students question theories of design, relate these theories to the task at hand, and engage in a creative process of discovery. The architecture studio creates a context where active learning occurs through

group or individual problem-based projects. The challenge of identifying a problem, defining its limits, and developing a creative approach to solving it, aids in the development of reasoned judgement, interpersonal skills, reflection-in-action, and critical reflection on practice (Schon, 1987), which form the basis of architectural education. In this model of experiential learning, a 'learning contract' exists between the students and the tutors, where the former are involved in establishing and negotiating through a design problem and the latter in guiding the direction of learning as facilitators (Beaty, 1999). Since the studio is 'student-centred' in its paradigmatic approach, it is therefore important to understand how specific learning needs intersect with socio-cultural diversity.

A 'socialisation into the culture' (Spouse, 1994) of architecture requires not just the acquisition of skills but also an understanding of rules and behaviours, and the expectation of a new field of language and communication (Simmons, 1994). Wilson's (1996) study on the 'socialisation of architectural preference' found that appreciation of architecture and standards of judgement were acquired within schools of architecture during periods of education. This socialisation took place mostly in the studio, a place where the embedded values and inherited traits of architecture were transmitted and social relationships between students, tutors, and peers were cultivated. Different architectural schools promote different types of studio cultures, which range from very informal to very formal models of learning. The studio as an architectural space provides a physical setting for developing specific modes of learning styles and combinations based on the interactions between those present within it.

Sara (2002) suggests that 'the studio set-up itself prevents the movement for liberation'. The studio by its very nature is a confined space, isolated from the social world through its very educational setting, and isolating for the learners who are meant to produce a blueprint for social behaviour through their design (AIAS, 2002; Till, 2005). Glasser (2000) too likens the character of the studio to an apprenticeship where the school's (and sometimes staff) ideologies are promoted. Indeed, motivational difficulties, insufficient instruction, and inefficiencies in learning, have been weaknesses in design instruction (Akin, 2002). This is partly because interactions in any architecture studio are based on power structures. These power structures are inter-scalar and interrelated. At one level, there is the power relationship between the tutor and the student where the student must prove to be an eager learner and the tutor must guide the student towards deep learning. Here Till (2005) illustrates how Schon's analysis of a typical studio project as 'reflection in practice' is flawed because of the tutor's control over the values acquired by the learner. At another level, there are power relationships between peers, where those students understood as active learners impose indirect pressure over those less active to 'perform' better. But on another scale, there are issues of university funding and the training of educators that influence student learning. The AIAS (2002) report stresses the need to provide adequate guidance to studio tutors in order to support a constructive learning environment. The RIBA (2003) report also identifies that funding in Universities has declined by 40% in the last decade, leading to an increase in staff-student ratios and a decrease in student-staff interactions. Hence learners and tutors are both caught up in the complex web of relationships of power between the

professional body, the architectural school, and the inherent values and codes of the discipline.

Gender Issues

As architecture forms the site of professional identity, the architecture studio as the context of learning provides the initial site of this identity formation. Education constitutes the accumulation of a cultural capital where learners are initiated into a collective professional identity that separates itself from others through their knowledge systems. 'The importance of education thus lies as much in its reproduction and transformation of the identity of students as in the reproduction and transformation of knowledge' as Ruedi Ray (2001, p. 79) illustrates. Architectural pedagogy thus attempts to develop this identity among students through the values and practices that they adopt in architectural design.

The public image of an architect as a white, middle-class, western male, known for his aggressiveness and egocentrism, has been popularised in literature and media (Stratigakos, 2001). It has been suggested that this is part of a 'masculine culture' developed from the early stages of architectural learning, where students are meant to take on aggressive attitudes during crits and reviews. Ruedi Ray (2001) illustrates how architectural pedagogy has historically constructed 'conservative revisions of masculine identity', which have persisted to this day. Various other educators have suggested the need to adopt a 'feminine' approach to pedagogy, making architecture a focus within feminism. This has included an increased interest in the needs of women learners and on the reasons why women practitioners leave architecture (De Graft-Johnson *et al.*, 2003). A recent report on architectural education (AIAS, 2002) identifies that the context in which learning takes place in the studio promotes certain behaviours and patterns, both among students and teachers. These are based on a 'macho culture', intense workloads of the architecture students, their 'unhealthy working hours', and the disconnection of architectural education from larger society, which results in a lack of support in the addressing of gender-specific needs of students. Learning architecture in a male dominated context (both in the gender composition of its staff and methods of assessment) therefore does not provide 'a healthy equitable educational environment for women to study in' (De Graft-Johnson *et al.*, 2003, p. 23). Hence across schools of architecture and in the profession, we see more women leaving architecture and switching to other vocations.

Gender is a social construction. This means that being 'male' or 'female' is not based on any ontological truth but that such behaviours are shaped by socio-cultural and physical contexts. Architectural learning is a gendered process where the 'conceptual change' (Biggs, 2003) brought about by education is mediated through gendered identities of learners. Phakiti (2003) suggests that learning strategies, motivation and the role of context are intertwined with these identities and that research is needed to understand why and under what context gender differences in learning occur. Indeed Anthony's (2002) research shows that both gender and race form part of the exclusions through which cultural homogeneity is maintained in pedagogy and practice. She suggests that architectural schools 'need to go beyond affirmative action requirements in order to promote a climate that values differences

and manages diversity' (2002, p. 257). Ahrentzen and Anthony (1993) too have proposed feminist models of learning that imply interdisciplinary learning, collaboration, communication techniques and a reconfiguration of learning as non-hierarchical.

Sotto (1994, p. 29) suggests that 'it makes no sense to decide how one is going to teach, before one has made some study of how people learn'. Learning more about learning styles will mean that educators can cater to different types of learners through new forms of education, which would also contribute to architectural practice (Till, 2005). As Milliner (2003, p. 1) suggests 'Hot desking, decreasing space, working from home, increased use of IT, diminishing staff contact, the consequences of student debt in terms of time available for study, all eat away at our preconceived notions of what a studio is, and require those on the ground to be ever more creative about how, where and when to teach design.' Indeed Demirbas and Demirkan's (2003) comprehensive study of learning styles in the design studio indicate that different learning styles are used by students at different stages of the learning process. The challenge to educators is to understand how these styles could be developed in students to increase deep learning. By knowing more about learning styles and catering to the needs arising from it, educators can help develop 'multiple modes of thinking' among students, where there are no fixed methods or fixed goals (Till, 2005).

In this paper, an example of a particular design studio was used to illustrate the gendering of learning styles and its relationship with learning issues. A survey of learning styles was conducted among male and female learners in a second year architecture studio and triangulated with learning issues within this studio to illustrate that learning styles are not just gendered but also that they have complex relationships with gendered learning contexts in this studio. Although this cannot be generalised for all design studios, it highlights the importance of examining and understanding gendered learning dispositions of learners in order to respond to learning difficulties among undergraduate students in architecture.

Learning Context

This study was carried out on Stage 2 students of the BSc in Architecture degree in a school of architecture in the UK. The questionnaires were administered at the end of the module after students had been through the academic year. Overall 49 students returned the questionnaires and took the Learning Combination Inventory. Of these 26 were male and 23 were female. All the students were ethnically Irish with only one Chinese-Irish student and one international student from China. All students were in the age range of 20-23 years except for two mature students above 30 years, of which one was also registered disabled. The studio was run by three lecturers. In addition there was a team of teaching assistants who were graduates of the school and practitioners in the profession employed on a pro-rata basis by the school. While male and female students were almost equally gender balanced, the tutors (both lecturers and teaching assistants) in the studio, with one exception, were all Irish men.

The studio space where learning took place was a large rectangular hall with windows on two walls. It was partially enclosed and part of a larger space with an atrium. Across the atrium, there was a similar space used by third year students. There was thus a substantial amount

of interaction between second and third year learners which increased peer support among those who spent more time in the studio. Within the studio, the space was laid out as an ad-hoc arrangement of tables. While there were more than 70 students at a time in the studio, there was space for only around 25 tables. This meant that less than half the students did not have tables assigned to them, which led to hot-desking as well as the inclination amongst many to work from home. This obviously influenced their learning and peer relationships as well as relationships with tutors. One-to-one tutorials were informal with groups of students gathering around each tutor to discuss their project. During formal assessment periods such as crits and reviews, students pinned up their drawings on the walls, and explained their designs to the tutors and peers. During such presentations, students were interrogated by tutors and sometimes their peers on the concepts and design solutions. While tutorials were one-to-one interactions, reviews and crits were more open and were perhaps the most challenging forms of assessment where students had to justify their design proposal through verbal and graphic communication in front of a group of tutors and their peers. Although verbal presentation was an important aspect of this exercise, students were only assessed on the models and presentation on paper, in other words, on the tangible part of this exercise. Most of the learning in the studio therefore took place through tutorials, reviews and crits, which Demirbas and Demirkan (2003) identify as a social interaction between the teachers and students that constitutes a very important part of learning.

Method

In this study two separate questionnaires were used. One dealt with using the Learning Combination Inventory (LCI) developed by Johnston (1996) to evaluate the learning disposition of each architecture student in the stage two undergraduate degree, and the other collected detailed information on gender specific learning issues. The LCI and the learning issues questionnaires examined the following themes.

- How students learn in the studio context.
- How gender differences manifest themselves through the learning styles of the students of Stage 2 architecture.
- The gender-based learning issues of a particular architecture studio.

The LCI is based on Kolb's learning cycles. It measures four learning tendencies: precise processing (PP) where learners demonstrate their need to know things with certainty; technical processing (TP) where learners feel the need to be involved first-hand with one's own learning; sequential processing (SP) where learning behaviours are aimed at establishing well-organised links with prior learning; and confluent processing (CP) where learners avoid convention and pre-established rules and pursue unique ways to complete any learning task. Translated architecturally, this means that learners with a PP tendency might want to be given very clear directions and requirements at the outset of a design project, those with TP might like to engage in hands-on modelling, those with SP might use design precedents and those with CP might attempt to break conventional norms by developing new concepts and designs. The LCI scores are awarded on a scale of 1-35 for

each learning tendency, where a score of 7-17 means 'I avoid this action tendency wherever possible'; 18-25 means 'I use this as needed'; and a score of 26-35 means 'I strongly favour this action tendency'. When evaluated on this scoring system, each student receives a unique set of four scores, each representing a learning tendency. The LCI assumes that a learner most often uses the tendency that gets the highest score. For example, a learner with scores of 19 (PP); 30 (SP); 20 (TP); 17 (CP) has a tendency to use Sequential Processing (SP) more often than other tendencies.

Johnston (1996) likens the LCI to a locking metaphor and suggests that unlocking each learner's unique learning combination is the key to addressing learning difficulties and understanding personal academic development. The LCI is an important tool since it attempts to understand learning dispositions of students and hence has a direct influence on pedagogy. The intent of administering the LCI was therefore to understand how the learning context in the studio influences the learning experience of different learners. The LCI was also important for students to understand their own learning behaviour and hence address how different learning dispositions create different experiences of learning in particular studio contexts.

The second questionnaire examined specific aspects of studio culture that impacted on learning, such as working hours, approaches to design, tutor support, motivation, and independence. This was handed out to the students at the end of the year and they completed and returned the form anonymously. Each student's learning combination was correlated to his/her learning issues, focussing particularly on gender specific aspects of the learning context.

Results of the Study

Learning Context

The Learning Combination Inventory showed a marked homogeneity in different learning dispositions of the students. The average LCI scores showed only a slight preference towards Sequential (average score of 26) and Technical (average score of 26) processing as against Precise (average score of 23) or Confluent (average score of 22) processing. This means that during the design process most learners used different aspects of the learning cycle at some point. The average male LCI showed a slight preference towards Technical Processing (scores of 22 (PP); 25 (SP); 27 (TP); 23 (CP)), which meant that these learners were involved 'hands-on' with their learning. The average female LCI however showed a slight preference towards Sequential Processing (scores of 23 (PP); 27 (SP); 24 (TP); 22 (CP)), which meant that they were more organised in establishing links with prior learning (such as the use of precedents). While this might indicate a slight gender bias, the fact that the scores for other tendencies fell within the range of 18-25 meant that both male and female learners used other learning dispositions when required and at different stages of the design process as Demirbas and Demirkan (2003) suggest.

This also reveals the discipline specific qualities of learning in architecture. It is not clear whether learning dispositions undergo a change in the studio or whether students are pre-

screened with these learning dispositions through entry level requirements. Wilson's (1996) study on different learners at different stages of the architecture degree suggests that students are trained to adapt to the preferences and value systems of the schools and tutors they attend. However, it will be interesting to carry out LCI tests on the same learners across their three years in the undergraduate degree and observe whether individual learning dispositions indeed undergo a radical change to adapt to the discipline of architecture.

Learning Architecture

There is a paradoxical understanding of architecture (Sara, 2002). On the one hand, its practitioners are represented by macho characteristics, but on the other hand its association with artistic connections seemed to attract female students. The questionnaires reflected this 'feminisation' of the discipline with 26% of the women stating it was their interest in art and design which brought them into architecture. Thirty out of the 49 students (of which 23 were male students), however, stated that they had always wanted to be an architect and knew what was involved.

To understand how far the students engage in active learning, they were asked to respond to questions regarding the purpose of learning and their personal design process. Twenty four of the 49 students responded that the purpose of learning was to develop a personal process of discovery that leads to a design solution, although more women (50%) than men (42%) showed this perception. In terms of the process of design, women (26%) showed higher inclinations towards using design precedents than men (19%) and none of the women said they took risks, while 19% of the men said that they did. This might suggest that female students were more likely to explore creative options through the use of precedents. However, precedents were used without analysis of their strengths or weaknesses, which meant that often female learners would pick elements arbitrarily without critically reflecting on their appropriateness. As Heylighen and Verstijnen (2003, p.325) suggest, precedents for learners 'are thus most powerful when they map directly and obviously onto the target problem'. If sufficient analyses of precedents do not occur, learners might not be able to use 'analogical reasoning' to benefit sufficiently from precedents.

In their initial approach to design, most students stated that they began by making free-hand sketches. A quarter of the students, however, used a combination of different approaches such as drawing two-dimensional plans, computer or physical modelling. Here, it seemed that male and female students enjoyed different aspects of the design process with some female students highlighting the design process as 'challenging' and the preparation of drawings as more interesting. Male learners however showed a preference towards modelling. This might also reflect on the slight preference in the average male LCI towards technical processing and the average female LCI towards sequential processing.

Students were asked to highlight the level of learning they had achieved in order to understand how many had achieved deep learning. Most students stated that they had acquired a variety of skills. The proportion of students who experienced deep learning however, was less than expected, with only 27% saying that they had learnt a creative process of discovery. These answers remained gender balanced and reflect the nature of the

learning context where students are educated in the skills required for employment and not necessarily for learning per se. When asked how they learnt architecture, 49% of students identified working in the studio as the primary model of learning. 58% of the men also cited reading, while 48% of women cited discussion with peers. Interestingly, only 33% of all students, and only 23% of the men, cited discussion with tutors as part of their learning in the studio. This is significant because it highlights the collaborative nature of architectural learning and stresses the importance of the studio as the primary learning space in architecture. It also highlights the role of tutors as facilitators.

A larger proportion of men (88%) than women (70%) said they would like to study further and qualify as an architect. This reflects on their experiences as learners in architecture which might not be inclusive to all students and hence reduces motivation for completion of the degree.

Studio Culture

Rozendaal, *et al.* (2001) suggest that self-regulated learning such as what takes place in the studio makes more demand on student time and effort than other forms of learning. Indeed, students worked an average of 30 hours a week on the design project. This is disproportionately higher than any other module in their degree. Twenty eight of the 49 students said that they worked all night on design projects, and 24 of them (this was evenly gender balanced) stayed up two-three nights a week. Thirty of the 49 students preferred to design at home rather than in the studio, with more male students (69%) showing this preference than females (52%). This supports the fact that 48% of the women cited discussion with peers as their primary model of learning in the studio. A higher incidence of working in the studio among women reflects the need for collaborative working practices and peer support among the women learners.

Glasser (2000) suggests that current studio cultures promote competition rather than collaboration, confrontation rather than community. After a crit, more women than men admitted to feelings of discouragement, uncertainty and vulnerability. Most men (69%) pointed out that they felt contented and motivated after the crit. Studies (Akin, 2002; Ahrentzen and Anthony, 1993; Frederickson, 1993) have suggested that unrestricted criticism during crits can lead to negative feelings, which impacts differently on male and female students' attitudes to learning. Therefore, 22% of the women felt that they were dependent on the tutors to tell them what to do, and 13% felt that tutors were always critical of their work. Interestingly, 80% of the men felt that they were able to work with the tutors to develop a design by listening and understanding each other, while only 44% of the women felt this way, which reflects 'male bonding' issues highlighted by De Graft-Johnson *et al.* (2003). Since studio learning occurs with a strong focus on interpersonal relationships (Oxman, 2004), it can encourage 'defensive postures' (Frederickson, 1993) among those who are not able to assert themselves in this context. For example, five out of 49 students (all men) stated that they were often assertive with tutors and more men (46%) than women (13%) said that they received constructive feedback. Since females rely more on surface processing modes when anxious (Rozendaal *et al.*, 2001), it might explain the vicious circle

where females become anxious through the crit process and tend to rely more and more on tutor direction.

Additional comments in the questionnaire by female students indicated that sometimes tutors were 'very critical and unapproachable' and that the criticisms that they were given were 'not constructive', which resulted in discouragement and lack of confidence among many. A female learner commented that she found it 'hard to get results that reflect the amount of work'. It seems that alienating styles of critiquing and assessment constructed negative learning experiences for the women, many of whom found the context 'very competitive' and most staff 'unapproachable'. Experience with bias can impact on openness to new learning experiences among these students (Frederickson, 1993). The approachability of staff, their ability to listen without prejudice and to provide constructive feedback are some of the critical factors in developing interest and motivation towards learning.

Summary and Recommendations

This survey is a limited exercise within a particular studio but it indicates gendered learning issues that should be addressed in all learning contexts. In this study clear gender differences have emerged in students' learning dispositions, how they approach the design problem, where they experience learning, and how they perceive their learning experience. The differences are based not only on their individual learning combinations but also on their experiences of a particular studio culture. These gender differences in learning cannot be used to draw general conclusions about learning in studios because of the limitations of this study, but can be taken as an indicator of how a particular learning context can produce differential learning experiences and motivation among male and female learners. The learning dispositions of students are part of this relationship between learning issues and learning context because inclusive learning contexts need to address differences in gendered learning dispositions among students.

Biggs (2003) suggests that deep learning is fostered in a motivational context. The relationship between deep learning and approaches to learning are strongly determined by the learning context in the studio where architectural pedagogy is said to be housed (Ramsden, 1992). It was evident that in various ways, the context of learning in this studio was gender biased and not sensitive to all gendered learning needs (Rolfe and Jasper, 1996). Clearly there is a gender bias both in learning styles and in the learning context in which more women find their hard work unrewarded and hence feel demotivated. Gender biases in this particular studio means that some female learners cannot benefit fully from its learning model. Indeed it was observed that more men than women were using deep approaches and enjoying their learning experience of architecture. The results of the survey reflect the gender based adjustments made by the students in order to become a recognised student-architect. These adjustments depend on the 'accepted' teaching and learning practices that guide tutorials and crits. The necessary adjustments which male students seem to make more easily are in becoming more assertive, and in establishing stronger relationships with tutors which result in their increased feelings of motivation than the

women. These subjective experiences shape career histories of both men and women and their future in the architecture profession.

Three main issues emerge out of this survey. Firstly, that gender differences in learning do exist in some studio contexts and that these differences are part of a socialisation into the culture of the discipline. Secondly, student learning is influenced by gender differences in learning dispositions through preferences towards different types of tendencies among male and female learners. This means that although students have to acquire specific skills and languages necessary to the profession, tutors have to be trained in facilitating this for all types of learning dispositions. Thirdly, student assessment has to move beyond traditional models of critics and reviews (that alienate female learners) to creatively address learning dispositions.

Ahrentzen and Anthony (1993) suggest that student learning can be enhanced by making pedagogic changes in studio culture. Adequate focus needs to be made on the right conditions for the development of deep learning in both male and female students of architecture. Tutors will first have to assess specific gendered learning needs of the students. One approach could be to use a learning needs questionnaire at the beginning of the module. Another option could be to use a 'semi-prescriptive' student journal (Blackmore and Jenkins, 1994) to identify constraints under which they might be learning. Encouraging students to record their course experience and periodically hold review meetings to exchange ideas and experience would help in promoting active and cooperative learning (O'Neill, 1995).

As Hodgkinson (1994) highlights, academic success depends on meeting a range of non-academic needs such as the context of learning experience. The apparent lack of gender specific targeting of learning needs and the lack of gender sensitivity in the learning context of the studio creates a condition where female students feel vulnerable and alienated. One possible solution could be to construct a support system for the new students where they would have a mentor (either staff or a senior student) with whom they can discuss issues and difficulties that they might face in the studio. Peer support groups could also be one of the ways where students can discuss their needs and be able to structure their learning accordingly. Moreover, most tutors in the studio find themselves thrust into teaching without much training in gender-sensitive teaching skills. Hence, they pass down teaching models gleaned from their own education without critically evaluating the hegemonic ideologies that may be part of these models (Glasser, 2000). Adequate training of all tutors in the skills of listening, reflective questioning, and gender-sensitive attitudes and behaviours would create a more inclusive context for learning.

Clark (1994) suggests that ownership and empowerment lies at the heart of deep learning and indeed the answers to the questionnaires did indicate this. Since learning is always connected with concurrent experiences, there should be as much focus in the curricula for gender sensitive design projects as there is for technology. The use of precedents as a knowledge base can be improved if students are given concrete directions to critically evaluate its concepts through analogical reasoning (Oxman, 2004). Various educators have

A. Datta: Gender and Learning in the Design Studio

suggested that coverage should also be given to work of female architects and female role models. Removing the over-reliance on crits and increasing the range of assessment methods to cover self- and peer-assessment as well as verbal presentation skills would provide more empowerment to the students and allow them more involvement with their learning.

References

- Ahrentzen, S. & Anthony, K. (1993). Sex, stars, and studios: A look at gendered educational practices in architecture. *Journal of Architectural Education*, 47 (1), 11-28.
- AIAS. (2002). *The Redesign of Studio Culture*. Washington DC: American Institute of Architects.
- Akin, O. (2002). Case-based instruction strategies in architecture. *Design Studies*, 23 (4), 407-431.
- Anthony, K. (2002). Designing for diversity: Implications for architectural education in the Twenty-first Century. *Journal of Architectural Education*, 55 (4), 257-267.
- Beaty, L. (1999). Supporting learning from experience. In Fry, H. et al. (Eds.). *A handbook for teaching and learning: Enhancing academic practice*. London: Routledge.
- Biggs, J. B. (2003). *Teaching for quality learning at university*. Buckingham: The Open University Press.
- Blackmore, P. & Jenkins, A. (1994). Course design for improved student learning. In Gibbs, G. (Ed.). *Improving student learning: Theory and practice*. Oxford: The Oxford Centre for Staff Development.
- Clark, R. (1994). Student opinion of flexible teaching and learning in higher education. In Wade, W. et al. (Eds.). *Flexible learning in Higher Education*. London: Kogan Page.
- De Graft-Johnson, A., Manly, S. & Greed, C. (2003). *Why do women leave architecture?* Bristol: Royal Institute of British Architects.
- Demirbas, O. O. & Demirkan, H. (2003). Focus on architectural design process through learning styles. *Design Studies*, 24 (5), 437-456.
- Frederickson, M. P. (1993). Gender and racial bias in design juries. *Journal of Architectural Education*, 47 (1), 38-47.
- Fry, H., Ketteridge, S. & Marshall, S. (Eds.). (1999). *A handbook for teaching and learning: Enhancing academic practice*. London: Routledge Falmer.
- Glasser, D. E. (2000). Reflections on architectural education. *Journal of Architectural Education*, 53 (4), 250-252.
- Heylighen, A. & Verstijnen, I. M. (2003). Close encounters of the architectural kind. *Design Studies*, 24 (4), 313-326.
- Hodgkinson, K. (1994). Course guides for flexible learning. In Wade, W. et al. (Eds.). *Flexible learning in Higher Education*. London: Kogan Page.
- Johnston, C. (1996). *Unlocking the will to learn*. Thousand Oaks, CA: Corwin Press.

- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. New York: Prentice-Hall.
- Milliner, L. (2003). Architectural education: Studio culture. Keynote paper to the *CEBE Concrete Centre Conference, Studio Culture 1: Who needs it?* 17-18th December 2003, St Catherine's College, Oxford.
- O'Neill, M. (1995). Towards a model of the learner in higher education: Some implications for teachers. In Smith, B. & Brown, S. (Eds.). *Research Teaching and Learning in Higher Education*. London: Kogan Page.
- Oxman, R. (2004). Think-maps: Teaching design thinking in design education. *Design Studies*, 25 (1), 63-91.
- Phakiti, A. (2003). A closer look at gender and strategy use in L2 learning. *Language and Learning*, 53 (4), 649-702.
- Ramsden, P. (1992). *Learning to Teach in Higher Education*. London: Routledge.
- RIBA (2003). *Architecture and Higher Education: Long-term opportunities and interfaces with the profession*. RIBA Council Discussion Paper, London.
- Rolfe, G. & Jasper, M. (1996). Evaluating a student-centred course through participative action research. In Gibbs, G. (Ed.). *Improving student learning: Using research to improve student learning*. Oxford: The Oxford Centre for Staff Development.
- Rozendaal, J. S., Minnaert, A. & Boekaerts, M. (2001). Motivational and self-regulated learning in secondary vocational education: Information processing type and gender differences. *Learning and Individual Differences*, 13, 273-289.
- Ruedi Ray, K. (2001). Bauhaus Hausfrau: Gender formation in design education. *Journal of Architectural Education*, 55 (2), 73-80.
- Sara, R. (2002). The Pink Book. In Harder, E. (Ed.). *Writings in architectural education, EAAE Transactions on architectural education*. 15, EAAE/AEEA, 58-71.
- Schon, D. (1987). *Educating the reflective practitioner: Towards a new design for teaching and learning in the professions*. San Francisco: Jossey-Bass.
- Simmons, J. (1994). Reflection in action: Supervising in-service lecturers' professional practice and learning. In Gibbs, G. (Ed.) *Improving student learning: Theory and practice*, Oxford: The Oxford Centre for Staff Development.
- Sotto, E. (1994). *When teaching becomes learning*. London: Cassell.
- Spouse, J. (1994). Development of professional knowledge in nursing students. In Gibbs, G. (Ed.). *Improving student learning: Theory and practice*. Oxford: The Oxford Centre for Staff Development.
- Stratigakos, D. (2001). Architects in skirts. *Journal of Architectural Education*, 55 (2), 90-100.

A. Datta: Gender and Learning in the Design Studio

Till, J. (2005). Lost judgement. In Harder, E. (Ed.). *Writings in architectural education, EAAE Transactions on architectural education, 26*, EAAE/AEEA, 164-183.

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Wilson, M. A. (1996). The Socialization of Architectural Preference. *Journal of Environmental Psychology, 16* (1), 33-44.