Retrospective Action Research on Facilitating Equitable Learning Outcomes in a Diverse Class

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Abstract: In a South African class with complex diversity, certain student groupings were not performing equitably in relation to their potential. An Educational Action Research (AR) process of designing multiple, integrated practice changes over three years successfully redressed disparities, but the full impact of interventions could only be analysed in retrospect. Combining empirical observations with subsequent data collection to produce a theorised model, a transferable methodology using quantitative triangulation was designed to overcome the challenges of a rigorous retrospective AR study. This article discusses the integrated teaching interventions and the application of retrospective AR methodology.

Keywords: action research, retrospective study, equitable learning outcomes, diversity

La Investigación Acción restrospectiva en la facilitación de resultados equitativos del aprendizaje en una clase diversa

Resumen: En una clase de Sudáfrica con diversidad compleja, algunos grupos de estudiantes no estaban teniendo logros que se correspondían equitativamente con su potencial. Un proceso de investigación acción educativa (IA) en el que se diseñaron cambios múltiples e integrados en la práctica a lo largo de tres años ajustó estas disparidades con éxito, pero el conjunto del impacto de las intervenciones sólo pudo ser analizado en retrospectiva. Mediante la combinación de observaciones empíricas y la subsiguiente recolección de datos para producir un modelo teorizado, se ha diseñado una metodología transferible que utiliza una triangulación cuantitativa para superar los retos a los que se enfrenta un estudio de IA retrospectivo riguroso. Este artículo debate las intervenciones educativas y la aplicación de la metodología retrospectiva de IA que se produjeron de forma integrada.

Palabras clave: Investigación acción, estudio retrospectivo, resultados de aprendizaje equitativos, diversidad

1. The problem context

This project did not start as an educational research study – it was simply an urgent teaching problem to be solved. I had started teaching Architectural Design (AD) to a first-year class in a Bachelor of Architectural Studies (BAS) degree at a South African university, using the pre-existing course, and found that in a class of students coming from diverse lived experiences, students with the same potential were not achieving the same academic outcomes. The learning outcomes were non-negotiable for the accreditation of the degree, the syllabus was set and the variables that I could redesign were the approach, format and content of actual

lectures and tutorials, assignments, student support and ways of teaching. In the context of a previously racially segregated society, epistemological access to university degrees was a social justice issue. My immediate challenges were: How should I change my teaching to give all students equitable access to successful academic outcomes? Equally importantly, how could I equip future architects with a broader social understanding that would enable them to be relevant designers in a diverse society? These problems had to be solved in action, without the time to test them. We tried various, simultaneous, potential solutions, making it difficult to track which teaching changes produced which results. The other key question was whether first-year teaching interventions could create a foundation for ongoing success in future learning.

2. Introduction

The process of developing improved ways of teaching AD happened over the three years in which I led the first-year AD course. By the end of this time there was an ever-improving pass-rate in the course, and it also seemed that students who had done the revised course continued to perform successfully afterwards. This merited a formal study, which was accepted as a PhD proposal, and is described in detail in the dissertation (Janse van Rensburg, 2015). The objective of the retrospective study, conducted after the changes in teaching had been completed, was to confirm whether these changes had indeed improved learning outcomes, whether these outcomes were sustained after completing the course, whether equal opportunities could be created by using this model, and to produce a theoretical model that could be applied in similar contexts.

AR principles had been followed from the beginning using a practice mode with a strong secondary emancipating mode (Kemmis & McTaggart, 2003), but the retrospective study required a shift to a knowledge-generating mode which presented additional methodological challenges. This paper also aims to describe the methods that were used to meet the criteria of dependability/reliability and process validity in a situation where student feedback and certain types of evidence were not consistently collected when the interventions started, and where continued outcomes could only be assessed after some time had elapsed. I believe that this can provide a precedent for similar studies where some data can only be collected after the actual interventions have been completed.

The contribution of this paper to the field of AR is therefore two-fold: It addresses the question of how equitable academic success can be facilitated in diverse learning communities, as well as how to produce valid AR in a context where one has to resort to retrospective data collection.

The action outcome of this study was that students' overall academic outcomes improved, and there was a much more equitable distribution of marks in the class, as we developed strategically sequenced educational tasks to build a foundation of social and academic skills while teaching the formal syllabus. This pattern of improved performance continued as these students progressed into subsequent years of study. This research is relevant in many diverse learning communities where disparities in prior experience can polarise or enrich learning, particularly in the escalating context of global migration.

The retrospective AR study triangulated study data with quantitative data from other sources, producing clear correlations and confirming the validity of this method. It produced valuable longer-term insights and conclusions that could not have been obtained within the time frame of the interventions. This methodology is particularly appropriate for complex situations where the effects of different interventions can only become clear to participants over time.

AR literature tends to focus on defined problems which can be addressed and assessed within the scope of a clear, short-term study. AR is however an effective tool for addressing complex, "wicked" challenges, and these studies are seldom described in textbook educational AR. I believe it is important to expand the methodology to explore this field.

This paper is structured to cover the choice of methodology with its attendant challenges in section 3, the socio-political and pedagogic context in which the problems developed and had to be addressed in section 4, and moves to the action component of the study in section 5: the problems, causes, theoretical base for interventions and the interventions themselves. In section 6 it discusses the research component, outlining the study parameters, how data was collected, processed and analysed, and the model construction. In section 7 the outcomes of the interventions are discussed in relation to the different types of data analysis and research validity is confirmed. Section 8 concludes with the learning from this study, both on pedagogy and on AR methodology.

3. Methodology

3.1 Choice of methodology

This complex course design challenge was very similar to an architectural design project, which as an architect, I initially approached in the same way. Every architectural design is a research project. One has to collect data on the context, the limitations, the challenges, the ideal functioning of the proposed facility, the available resources and technologies and successful precedents. One is in a constant dialogue with the client to understand his/her needs and wants, and whether the design is addressing them. One has to understand the theory, and from an analysis of this complexity produce a single, integrated proposal that addresses all these issues. After testing the proposed solution against these criteria, one evaluates and adjusts it, until one reaches a satisfactory balance of outcomes and then resubmits this to the client for critique. It is a cyclical dialogue of problem definition, design, testing, observation and improvement, very equivalent to an Action Research (AR) process, but it has the advantage of being able to test multiple iterations before building the final one.

The closest recognised research methodology was Educational AR, as in addition to comprising cycles of improvement, I was applying "informed, committed and intentional educational action (McNiff, 2010, p. 16)" that problematised existing forms of educational practice (Newton & Burgess, 2008). It was participatory in that the process was constantly being informed by conversations with students and colleagues, all changes were immediately tested by students and their learning outcomes were assessed throughout this process, informing the process. It conformed to McNiff's definitions, as it centred around my own learning in order to bring about social and educational change in my studio, hoping to

establish more equitable education praxis (social justice) in a broader academic and professional context (McNiff, 2010). This resonates with Kemmis and McTaggart's (2003) emphasis on aiming to bring about changes in people's learning, actions, values, interactions and interpretations. The people in question were my co-teachers, my students and myself as we interacted to create a better integration between our roles and the course content.

Although the action component progressed with some momentum in this direction, it was only two years into the process that it became a research study, producing some challenges that had to be specifically addressed.

3.2 Methodological challenges and limitations

Retrospective student feedback: The only formal feedback from students on our teaching at the time of the course changes was the standard annual university course evaluation, in which the questions did not specifically address our interventions. Because ethical approval for the study had to be obtained before students could be formally questioned on their experience, this only happened after students had completed the course and had to rely on their recollections. As they were no longer primarily focused on this course and some were no longer on campus, there was a low response rate. The academic staff being questioned had to recollect specific observations on a repetitive timeline of similar events, and in all these situations the validity of memories had to be confirmed.

Complexity: Many educational AR projects set out to address and improve a single issue with a single intervention, making it simple to design a study and attribute causality. This study contained many integrated variables, while both the course and the students had changed every year, making it more difficult to make comparisons and ascribe causality.

Limited documentation of student learning: The consistent data from the study period was a full and meticulous recorded of every student's marks per assignment, but this is a compressed quantitative indicator of the combination of skills, understanding, learning, time constraints, personal challenges and available resources. The formative discussions en route to those marks had been oral and unrecorded. I had informal notes on particular students' work and random projects that were documented for administrative reasons[1], but it was a concern whether this data would be sufficiently representative to achieve saturation in a qualitative research context.

Undocumented observations and changes: AD is primarily taught in a studio format, where students present their work for critique and there is the opportunity for teacher interaction with every student. My role as the studio leader was to design the detailed course content and give the lectures, while I was assisted by three equally qualified part time co-teachers ("staff tutors") in studio critiques. As a teaching team we gained considerable insight into every student's engagement, effort and understanding and the common learning problems that emerged in the class, but our observations and discussions at the time were not documented. The rationale for changes to teaching formats, although carefully considered and agreed on as a team, had not been documented per se, and there was no consistent reflexive journaling.

1 Digital submissions were not yet the norm during the study period.

3.3 Research rigour

In the context of the outlined limitations, the retrospective study required:

- A forensic reconstruction of everything that had been observed, taught and changed in the AD course over the three cycles of change being studied, to locate evidence of student learning outcomes on this timeline.
- Establishing the validity of certain constants that could be used to benchmark outcomes in various situations that could not be compared directly.
- Triangulating between as much past data and contemporary recollection as possible in order to confirm validity. This included an extensive peer-review process.
- Structuring questions to participants to focus on the current effect of past interventions rather than the detail of the intervention at the time.

4. The practice context

To facilitate equitable learning outcomes, it was necessary to realign teaching biases with changes in the South African student population, and some background is necessary to contextualise this study.

4.1 Socio-political context

The problem context is that Architecture has for long remained a particularly elitist profession, especially in South Africa where prior to democracy, studying architecture was limited to universities that only admitted White students. Although private schooling was always open to those who could pay, government school education was at the time segregated into racial categories, where generally only urban "White" schools prepared learners well for university. This did not change much after democracy, excepting that it became possible for a small percentage of better-resourced Black[2] learners to move or travel to previously White areas in historically segregated cities for schooling. The selection processes that allow students to study Architecture have traditionally favoured students with high architectural cultural capital, which are generally related to international standards of schooling, art education and the ability to travel internationally and experience architecture. As long as this type of prior knowledge and college-readiness could be assumed, teaching remained largely unchanged.

After democracy in South Africa in 1994, architectural studies became accessible to anyone who met the selection criteria. These have always required a good academic record, but other aspects were Euro-centrically biased. Some universities have in the last decade broadened their other criteria to prioritise potential ability and motivation over cultural capital. Since democracy, government funding has been made available to students who would previously have been economically excluded from attending university. The aim has been to transform the demographic profile of universities and professions, but the profile of architecture degree-students only started to diversify significantly in the last decade. All South

2 In line with current usage, this denotes all ethnicities that were not previously racially classifies as "White"

African universities have also shown markedly lower throughput levels across all fields during this period, caused by other factors than diversity.

The student diversity to be addressed in the BAS degree is complex, and there are no simple corollaries between any of the other variables, including ethnicity. Students now represent the full economic and schooling spectrum, with an increasing number of first-from-family university students. Some students come from rural areas with no first-hand experience of architect-designed buildings or urban complexity; some students have little previous technical experience; some no computer literacy and some no art training. AD demands strong analytical and creative skills which are still not taught at many secondary schools. The language of instruction at the study site is English, which for more than half the students is not their home language.

When I first taught the first-year AD course I discovered to my concern that by mid-year, in a class of students with very comparable and high potential, 50% of the Black students were failing, compared to 12.5% of the White students. Clearly our teaching was not equally accessible to all students.

The history of racial integration in higher education in South Africa since 1994 has been led by pragmatic policy changes that first addressed the most obvious discrepancies. The issues that remained unresolved by these changes became the next focus of attention. This roughly followed a trajectory of opening physical universities access, providing more personal support to students (bursaries, more on-campus accommodation and bus services, feeding schemes); offering additional generic academic support courses to first-from-family students or students identified as "at risk of failing" and trying to facilitate social belonging by nominally recognising different histories and cultures (Council on Higher Education, 2010), but this only recently started to move towards a discourse about academic paradigm shifts and decoloniality (Jansen, 2019). Transformative change at universities has been implemented at an institutional level, but changes to individual courses have been at the initiative of individual teachers (Council on Higher Education, 2010).

4.2 Institutional pedagogic context

The architectural education framework followed at our university follows an internationally accredited studio teaching model, suitably adapted to local circumstances, which can potentially respond to the challenges we encountered, if pedagogy is approached inclusively. AD is the core course in every year of study and a student must pass this to proceed to the next level. AD integrates and applies all the knowledge that is taught separately in students' other courses. The basic skills and concepts that are taught in first year are applied in increasingly complex contexts in second and third year, making passing first-year AD the gatekeeper for the profession. Every year 70 to 75 new students are admitted into first year, and the class may have up to ten additional students who are repeating the course. Within this small group there is a wide range of demographic variables, so there are many different combinations of needs. The formal timetable for BAS is completely full – it is not possible to add an hour a week. The learning challenges that students face are often broader than mastering AD per se, but since AD teaching methods can be flexible and the course takes up most of students' timetabled and self-study time, it can be redesigned to integrate the required additional or broader learning within the same time constraints.

The generally accepted learning format for AD is that students all work on their design assignments in a physical studio space, where peer discussion takes place. For each assignment students are given a specific site and a design brief. In the studio, in small groups, students' developing designs are individually critiqued (formative assessment) by staff tutors, enabling them to also learn from each other's feedback. This is a scaffolded learning process as described in Vygotski's proximal development zone theory (Daniels, 1996) in which tutors impart both tacit and theoretical knowledge (Schön, 1983) specific to each student's project. This learning process is supported by lectures in which the theoretical content for the assignment is explained to students, but the additional content specific to each particular design is given in the critiques. In the design of the AD course there is the opportunity to use some studio time for workshops, tutorials or field trips.

This learning process in which there is individual communication with each student around their insights and understandings provides an ideal platform for informal communication with students around their learning, which barriers they experience and how these could be overcome, e. g. if a student was not applying a principle that had been explained in a lecture, I could ask whether my explanation had made sense to her, and her response would explain whether she did not understand the terminology, or that she could never attend that lecture because the last bus left earlier, or that she did not know how to apply that theory in practice.

The other formal opportunities for student participation in addressing learning challenges were my monthly meetings with student class representatives, who would also message me about any general problems the class was experiencing. In these meetings I often sought their feedback on potential solutions.

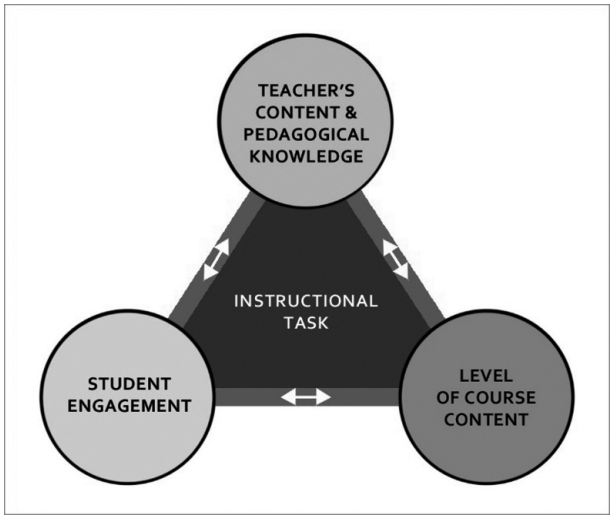
I also set up individual meetings with students who were falling behind to discuss their progress and to encourage them to develop strategies to overcome individual challenges. Other students also spontaneously came to discuss the learning they required to reach their goals. This range of conversations gave teachers a relatively deep understanding of students' circumstances and aspirations within the normal teaching format.

All the different teaching modalities and communication opportunities together make up the triad of course content, teacher knowledge and student engagement required to support the educational task according to the theories developed by Doyle (1983), as described in City, Elmore, Fiarman and Teitel's instructional core diagram (2009) (see figure 1). They summarise that learning happens and shows in the educational task, and that to improve learning, all three support components must be changed – simply adding course content or encouraging student engagement in isolation will not bring about the desired improvement. The advantage of design assignments rather than tests as educational tasks is that they give substantial qualitative evidence of which learning outcomes are achieved or not achieved.

The "student engagement" component which in this model signifies students' engagement with study material and assignments, simultaneously presents an opportunity for students and teachers to engage in a dialogue about their learning.

The final outcome of each design process is the submitted assignment presentation, which is summatively assessed by the whole teaching team in relation to all the required outcomes. Outcomes are simple in early assignments, accumulate in subsequent assignments and must all be successfully integrated in the last assignment. At the end of the year each student pins up all assignments for an integrated oral assessment of whether (s)he has met the required learning outcomes for the year, and is questioned on his/her application of design theory by examiners. This final assessment has enough weight (30 %) to allow a student to pass the year

Fig. 1 City et al's Instructional Core Diagram (Janse van Rensburg, 2015, p. 73)



if all the required outcomes have been achieved, even if they were not yet evident in earlier assignments, or to fail if there is insufficient evidence of understanding. The final year mark for AD is therefore an integrated assessment of all required design learning outcomes, and a good measure of successful architectural learning.

5. The action component

5.1 Problems

Within the outlined practice context, a range of problems that affect learning started to manifest in the more diverse studio that do not necessarily occur to the same extent in more homogeneous, privileged environments. They included the following:

- Students with little exposure to precedents relied mainly on their imagination, without seeking contextual grounding.
- The students who most needed knowledge, did not attend the lectures.
- Students tended to work in isolation and not present work for critique until they considered it to be "complete". If they had misunderstood the brief, or were designing from a problematic premise, it was too late to restart. Since they were not developing their ideas in relation to feedback, they were not learning and tended to think that a first idea was a resolved design, misjudging what was required.
- Students often did not design to the requirements of the brief, and sometimes not respond to advice.
- Some students thought of design as a drawing, and not a representation of something that should work in real life, while others did not have the basic drawing skills to communicate the practical idea that they envisaged.

- Some students could not adequately express their ideas in English when presenting their work, while many students who were orally adequate struggled with written academic English.
- Most students struggled to meet submission deadlines.

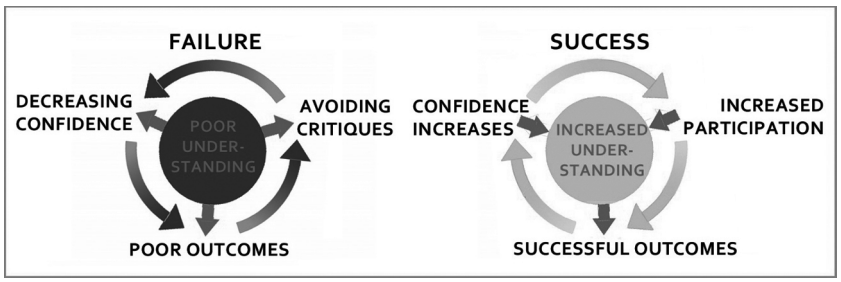
5.2 Underlying causes

Before I started teaching first-year AD, the course had been taught in the same format for several years and I had already observed gaps in students' knowledge and understanding in later years of study, so I modified the course from the outset by adding formerly-assumed content. With time it became obvious that even when this content was available, there were barriers to student engagement with the learning process which could not ethically be dismissed as "students' own responsibility". As clarified in instructional core theory (City et al., 2009), addressing these barriers also required additional teacher knowledge and skill, particularly in social theory and pedagogy.

We became increasingly aware of students' challenges and circumstances through informal conversations with students, especially those relating to requests for deferred submissions. When expected learning outcomes did not manifest, we questioned students to find out which learning barriers they experienced, and keenly observed their work and their interactions.

Student engagement with lecturers was strongly affected by their design confidence, leading to self-perpetuating spirals of engagement and success, or avoidance and failure, producing a growing learning differential (see figure 2).

Fig. 2 Spirals of student engagement (Janse van Rensburg, 2015, p. 152)



There were many underlying causes for poor confidence and engagement with lecturers and peers, including social exclusion related to internalised dominance and oppression (Davis & Steyn, 2012). If students felt underprepared, they did not want this to show, so in a context where peer discussion can bridge many gaps, students tended to keep to their own social silos, not benefiting from each others' experiences and understandings. Lack of understanding of instruction was often due to inadequate English skills, inadequate grounding in higher-level academic skills that included finding and managing information, argument construction, time management, etc. First-from family students often did not know how to negotiate the university environment and expectations. Students with economic constraints could often not afford the taxi fare to attend lectures or studios. In a very demanding course, some students

who could not afford campus accommodation wasted many hours a day commuting, or figuring out how to negotiate a new environment, and no one had the time to attend the generic support courses offered by the university (Janse van Rensburg, 2015).

Some of these causes were course-related and some personal, but if the effect of personal difficulties could be minimised through course design, e.g. by ending studios before the last bus left, or specifying drawing sizes that could be printed on home printers, it was important to understand and accommodate this.

5.3 Theoretical base for interventions

To understand and address the observed phenomena that caused sub-optimal learning required a broad theoretical base ranging from design pedagogy, language learning, college readiness, critical social theory, transformation theory, contextual knowledge on the history of education in South Africa and theory of change, discussed in detail in the PhD literature study (Janse van Rensburg, 2015). Some of the more important social theories informing the design of interventions are:

- Bourdieu's theories on cultural reproduction (Bourdieu & Passeron, 1990) which explain the action of cultural capital in resisting the transformation of any field, be it a profession or an academic institution.
- Clegg's critical social theories (2011), which explore the interplay of different types of capital and alternative resources available to students with lower cultural capital.
- Jank's theories on the access paradox (2010), where role players in the academic world must develop a dominant voice in order to be taken seriously when representing marginalised positions.
- Current critical diversity literature (Davis & Steyn, 2012), based on Freire's theories on internalised identity constructs (1990), which explain how dominance and repression are hidden and replicated, how they affect people's interactions, and what it takes to undo them.

5.4 Changes introduced into the course

Strategic approach: As first-year teaching should ideally bridge gaps before students fall behind, the overall strategy was to pre-emptively address potential problems from multiple angles simultaneously, in the hope that something in the synergy of interventions would improve the outcomes. This is diagrammatically illustrated in figure 3.

Some of the basic strategies were

- to create social cohesion in the studio to facilitate peer learning
- to level the academic playing field by embedding the learning of contextual and academic skills in low-stakes projects before formal activities demanded them
- to embed all forms of additional learning in design assignments rather than setting additional exercises
- to validate all students as individuals, but offer correction and additional support collectively to all, without singling out those who needed it

- to equip students with an academic voice to enable them to express individual identity with authority
- to explain how learning happened, why teaching was offered in the way it was and how students could best benefit from the university environment
- to provide alternative pathways to the same learning outcomes
- to teach flexibly and responsively
- to reiterate required outcomes so that students could demonstrate that they had learned from unsuccessful attempts and gain confidence

New interventions: The interventions that were used to achieve these strategic aims fell into one or more of the following categories:

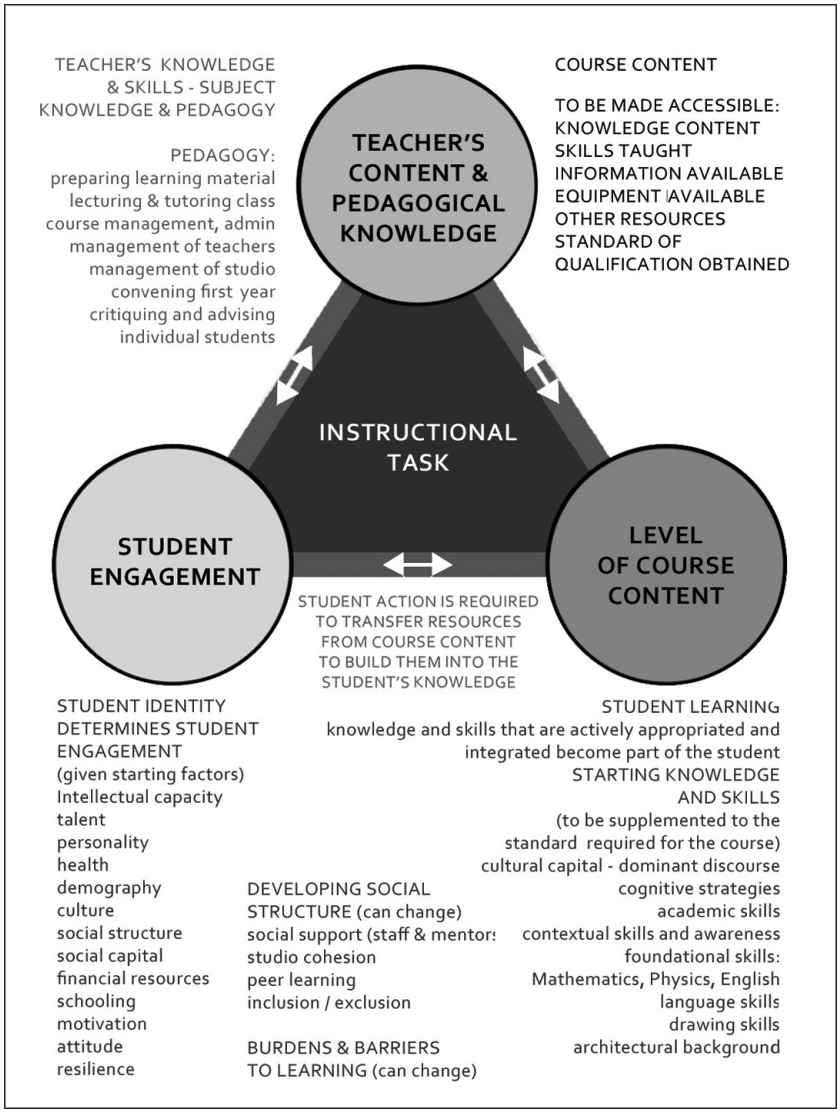
- Group activities where diversely-composed groups were confronted with challenges that could not be solved individually and were not dependent on prior learning
- Contextual Preparation – practically introducing students to the urban and architectural contexts and precedents
- Academic Preparation: introductory lectures and ongoing workshops on how to negotiate the academic environment
- Additional course content in the form of graphically well-illustrated lectures, available for reference afterwards
- More "open site" assignments in which students could choose to design in a context with which they were familiar and contextual peer learning happened as students presented their designs to the class
- Additional generic formative feedback to the whole class
- Additional tuition to the whole class on concepts with which a significant number of students were struggling, which also improved good students' mastery.
- Tutorials and workshops to establish design thinking or practical skills by guiding students step-by-step through new processes in small peer-discussion groups.
- Tuition through active rather than language-based learning wherever possible.
- Specific academic language tutoring embedded in design assignments
- Individual feedback to students on the skills that they needed to strengthen

Every educational task incorporated combinations of these interventions.

5.5 Cycles of change

The first cycle commenced in the first year that I taught the pre-existing course with expanded course content in the form of lectures. Workshops and tutorials were added in the second half of this cycle, more group activities were introduced in which groups were composed by staff rather than by students. In the second cycle, the teaching approach was adapted to include specific academic and contextual grounding during orientation week, scaffolded guidance on design processes and practical skills, and there was more emphasis on social integration. Some interventions that had additional staff and budgetary implications such as embedded language tutoring could only be introduced in the third cycle. By the third cycle the sequencing of different types of learning had been optimised. This version of the course was repeated for two more years, once led by a colleague and once by me. We observed a generalised improvement of learning outcomes throughout each class over the three cycles of change. Our interventions

Fig. 3 Representation of intervention points related to City et al's instructional core diagram (Janse van Rensburg, 2015, p. 187)



developed from "emergency intensive care" to recover from failure into the pro-active building of engagement and skills that avoided failure, and I gradually built a theorised understanding of the strategic timing of interventions.

6. The research component

The study to formally and retrospectively investigate the outcomes of these interventions moved the AR into a knowledge-generating mode. The detailed description of how this was designed to mitigate potential inaccuracies caused by the elapse of time between the teaching interventions and the study can be found in the PhD dissertation (Janse van Rensburg, 2015), but the broad methodology is outlined here.

6.1 Research parameters

Time scale: The outcomes of the three years (cycles) of interventions had to be assessed in relation to the preceding version of the course, and the outcomes of the final iteration had to be shown to be comparable with different students and teachers. It was also important to ascertain whether students had integrated this learning or had only been temporarily supported to perform better and relapsed afterwards. The three cycles of change were examined in detail, but within the context of student data covering the six-year period from the year preceding the first cycle to two years after the last cycle, which included those students' AD learning outcomes in subsequent years of study.

Changes in the demographic composition of the architecture student cohort were mapped over a ten-year period. Because of the political emphasis on broadening the racial and gender composition of the profession there was particular institutional interest in mapping student success in relation to race. The gender composition consistently mirrored that of the general population.

Research participants and study sample: The study population consisted of all students who had registered for first-year AD during the detailed study period (n=316). All these students contributed to the production of new knowledge, as they were active participants in discussions on their learning, and they were constantly testing the teaching interventions. Their assignments embodied evidence of how the teaching interventions had affected their learning. All these students were invited to contribute their insights in a retrospective survey, but only 259 students could be contacted, and only 54 of these responded.

The other group who were keen participants to transform pedagogy were the full cohort of the sessional staff tutors who co-taught in the first year AD studio during the study period.

Since they represented different ages, cultures and experiences, our discussions opened valuable insights. A 100% sample participated in the retrospective focus-group interview and wanted to be informed of the study outcomes, but they were not available to become involved in further analysis.

The third group of research participants were teachers who had taught AD to the study population in subsequent years. They were all invited to a focus-group discussion and a representative group responded to the invitation, including all the studio leaders.

All relevant ethical permissions were obtained from the university and from individuals. The confidentiality of student identities was maintained.

6.2 Data collection

Existing documentation: There was university data (demographic data and academic outcomes) on all students who had been registered for AD during the study period. For every BAS applicant our programme had selection scores based on an equal weighting of school marks, set admissions exercises and interviews. For every student I had taught there were detailed marks for all assignments, records of attendance, reasons for absences or late submissions. There were photographic records of some assignments, personal e-mails and records of meetings about the problems that students encountered. There were anonymous student course evaluations with some responses to open questions, and there was feedback from external examiners.

From the teaching side, there was a complete set of course outlines and assignment briefs for every year of study. For the years when I taught, there were also full records of lectures, briefs and photographs for tutorial workshops, formal generic feedback to the class and individual feedback sheets for every assignment. There was a high pile of random documents including notes to self, notes on student's progress on studio registers, diary entries and numerous e-mails. It was a daunting task to distil this and find the essence.

Data collecting instruments: The formal data still to be obtained was feedback on students' experiences of learning in first-year AD, and teachers' learning about students' learning. What had students found challenging and why? What had been helpful or problematic? What results did the interventions produce?

This was obtained by inviting all students in the study population to respond to a semi-structured questionnaire on their experience of the first-year AD course after completion of the course. Lived experience and demographic variables that could potentially influence learning were covered by closed questions. The response sample was too small to be representative of each year-group's composition by race and by gender, but respondents included students of from all sub-groups and contexts. Although no statistical inferences could be made, the responses presented sufficient material for qualitative analysis to produce valid results.

The teacher feedback was obtained through two separate focus groups, with an opportunity before the interview to review course information sheets, to which participants added their own notes. Co-teachers in the first year AD course addressed: "What has been your experience of the outcomes of teaching in the ARPL1000 course over the past four years?", while design teachers in higher years focused on "What has been your experience of the outcomes of teaching in the ARPL1000 course over the past four years?".

6.3 Data processing

Reconstructing the missing research journal: The first step was to construct an accurate timeline onto which all existing data could be sorted, in order to recount what had happened during each teaching cycle. This deep immersion in the data prompted many recollections, but also served as an accuracy check. The first account was a writerly narrative. I tried not to interrupt the stream of memory by jumping to hindsight, inserting theory or trying to assign importance to events. The second writing of the narrative aimed to construct a "history of

significance (Carr, 1961)", structuring the account to describe teachers' learning about students' learning in each cycle, and relate this to theory. It was important to do this before opening the student questionnaire responses.

Constructing data sheets: In order to identify relational correlation between selection scores, learning outcomes, demographic variables and course iterations, without establishing causality (Light et al., 1990) all quantifiable institutional student data was compiled into a data sheet and cleaned. The sheets were constructed so that they could be sorted in different ways. When sorted chronologically, it enabled one to check the emerging qualitative narrative against the complete quantitative record over time and account for all outcome changes throughout the narrative.

6.4 Data analysis

Quantitative analysis: The student data sheets were analysed with the assistance of a statistician (Gaylard, 2013) to produce descriptive statistics. Many binary relationships were investigated to confirmed which correlations between demographic descriptors and learning outcomes merited further analysis. This also identified some discrepancies between students' self-perceptions and performance, e. g. Most of the first-language vernacular speakers who had received secondary schooling in English described themselves as first-language English speakers, but 50 % of these respondents reported that they had great difficulty in understanding written assignment briefs.

Two useful indicators emerged that could be used for benchmarking:

1. Student selection scores are only an approximate measure of student potential, but despite these limitations, there was a weak positive statistical correlation between the selection scores and AD results of the study sample over the six-year period. (Janse van Rensburg, 2015, p. 114). In the first cycle it was clear that a significant cluster of Black students was performing below the trend line, and the majority of White students were above the trend line. By the third cycle, this had become a random distribution, and one could map changes to the ratio of average AD mark to average selection score in a group over learning cycles.
2. The assumption that the first-year AD mark should be a good indicator of a student's overall performance in this degree was strongly confirmed. (Janse van Rensburg, 2015, p. 31).

Qualitative analysis: All qualitative analysis followed the principles of finding recurring themes in the data and critically recognising underlying content as advocated by Charmaz for open coding analysis (ICQI, 2012) and in thematic content analysis (Van Zyl, 2014).

The focus group interview transcriptions were bulk-reduced by summarising, paraphrasing and extracting quotations, and then vertically analysed with reference to any written or graphic notes that participants made on the information sheets. The two vertical analyses were horizontally analysed without much overlap of themes although it was possible to integrate the data around student year groups.

The open question responses from course evaluation sheets were transcribed onto a spreadsheet where they were arranged per year of study and coded.

The open student questionnaire responses were on a survey-generated spreadsheet. Without consulting the demographic data, I first highlighted theme words and quotations in the open responses and then vertically analysed these by theme. I then examined the themes in relation to the demographic information and finally sorted the spreadsheet by year, by demographic groupings and by themes before returning to the narrative to code this by themes.

I finally did a horizontal analysis of narrative, questionnaire and focus group data from different perspectives and compiled analyses of my findings based on themes, barriers to learning, teaching years, racial categories and strategies for improvement. Any inconsistencies between different data compilations were interrogated, and findings were compared with theory until all inconsistencies could be accounted for. This process transformed our empirical learning into a theorised understanding of practice, resulting in what McNiff calls "living theories of practice" (2010). In Mayan's words, what one observes, learns and understands from practice allows one to build theory (Mayan, 2009).

6.5 Model extension

The relevance of the instructional core model (City et al., 2009) was strongly confirmed by my research, but I found that when a student's prior experience was not aligned with privileged academic expectations, students' attempts at engagement were often hampered by various barriers outside their control, including biased teacher expectations. Student engagement should therefore not be dismissed as students' own responsibility, but be facilitated by the course design.

My "living theory of practice" became an extension of the structural core model. The study confirmed that concurrent personal, social, academic and contextual learning can facilitate student engagement to create equitable access to architectural learning. Ideally, every educational task should be designed to produce learning on each of these levels. The timing of different types of learning is important to enable student engagement in time to meet the required outcomes.

City et al's instructional core model (2009) does not extend to the time dimension, and the learning from this study led to the development of an expanded transformational learning model in which the relationships between personal, social, academic and discipline-related learning could be conceptually represented over time, within the triad of teacher knowledge, student engagement and course content.

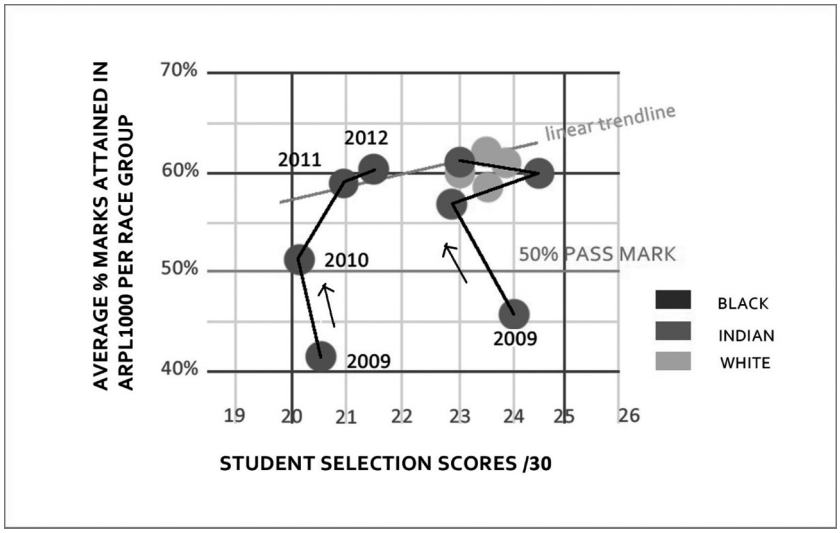
7. Research outcomes

The study outcomes confirmed that the changes made to our teaching had successfully improved the imbalance of academic outcomes in the first-year AD course and produced better peer learning in a diverse studio. Over time it became clear that this improvement in learning continued during subsequent study years, and that a basis for good learning had been established. This validated both the methodology that was used to produce these changes and the new teaching theory that the study produced.

7.1 Action validity

This AR study confirmed that during the study period, the average class AD learning outcome (for all students who were assessed) improved from 58,3 % in the first cycle to 61,02 % in the third cycle and consistently improved after that as the same model was applied, despite a drop in the average selection scores over this period. The class improvement was greatest in groupings that were performing below their potential, and by the final cycle of teaching changes there was no longer a performance differential between different race groupings in the class (see figure 4), or a mid-year dip in assessment.

Fig. 4 Graph showing the equalisation of student learning outcomes in relation to selection scores between previously segregated groupings over the cycles of change (Janse van Rensburg, 2015, p. 329)



Throughput improved and far fewer students who were not meeting the course outcomes abandoned the course during the year. Over the three cycles the attrition fell from 16,5 % to 10,1 % to 3,8 %. The majority of students who had failed first-year AD and repeated the course performed in line with their potential at the second attempt and continued to do so in subsequent years. Only 2,8 % of students who successfully met the learning outcomes for first-year did not pass third-year AD at the first attempt, indicating that the embedded personal / social / contextual learning in first-year continued to sustain their architectural learning, and enabled them to develop a good foundation in AD.

A major contributor to the improvement in learning outcomes was the improvement in social cohesion in the studio and the resultant peer learning and support. Over the three cycles there was a decrease in the differential between the lowest and the highest marks in the class, a decrease in the number of students who failed the course and an increase in the class average mark for AD. By the end of each study year students were choosing to work in diverse groups when this was not enforced and this pattern continued in subsequent years. This is an indicator that these graduates are likely to be better equipped with the social understanding needed to design for a diverse society.

Many of the strategies developed in this study were disseminated and voluntarily implemented within the Department, Faculty and at architectural learning sites at other universities. Some relevant strategies were also adopted by other faculties in the university.

The disadvantage of the extended study was that by the time the research was published, the cutting edge of transformational teaching had moved on to decolonisation rather than creating epistemological access, but the principles embodied in the model and the usefulness of the methodology remain equally relevant.

It can therefore be concluded that this research has demonstrated outcome validity (Herr & Anderson, 2005), personal validity (McNiff, 2010, p. 14), democratic validity (Herr & Anderson, 2005), transferability and generalisability.

7.2 Research validity

This brings us back to the initial question of whether it is possible to do a retrospective Educational AR study that meets the criteria of dependability/reliability and process validity if student feedback and certain types of evidence were not consistently collected at the time of the interventions.

During the course of this study a complete audit trail could be constructed of the retrospective narrative reconstruction process. The descriptive statistics provided a comprehensive quantitative description of the study period that substantially matched the qualitative analysis and theory, dispelling fears that a retrospective study might be invalidated by gaps or inaccurate recollections. There were multiple opportunities to subject this research to critical peer scrutiny through symposia and conference presentations while it was in progress, which generated agreement and interest in applying these methods in other contexts. This indicates that a rigorous retrospective study can demonstrate dependability (Mayan, 2009) process validity (Herr & Anderson, 2005; Newton & Burgess, 2008) and dialogical validity (Mayan, 2009; Newton & Burgess, 2008).

8. Conclusions

8.1 Pedagogy

In a diverse post-colonial world where information is readily available, it is increasingly important in academic environments to facilitate collaborative learning and a context of social understanding in which learning can be applied. The extended learning model developed in this study not only produced improved academic outcomes, but also improved social learning. The improved understanding, trust and confidence that developed in and between teachers and students as a result of our collaboration to improve learning outcomes was more empowering to all the participants than the improvement in academic results.

8.2 The way forward

Although the strategies and interventions used in this study facilitated a considerable improvement in students' learning outcomes, they could not deeply address the issue of internalised identity constructs in students and teachers which continue to prevent students from reaching their full potential. Work on decoloniality has continued since the completion of this study, and the most important things that I learned from this study are that

- learning outcomes are only one of the symptoms of biases that have become normative and have to be addressed with self-critical integrity at a fundamental level in every field;
- AR is by its nature participatory, collaborative and validating, and facilitates delinking from established assumptions while investigating these issues
- the next steps in liberating students' potential must be taken even more collaboratively.

8.3 AR methodology

It is possible to do a valid retrospective AR study if the original action part of the process consisted of intentional cycles of improvement with sufficient participatory dialogue to inform them. The limitations outlined in section 3.2 can be overcome using alternative strategies to collect, compare and analyse data retrospectively.

Despite the disadvantage that not all students in the original study group could be reached for retrospective feedback, it is likely that the overall impact of teaching could be gauged more accurately by both students and teachers after some time had elapsed, and the most important learning emerged with greater clarity. For me, the painstaking reconstruction of the complete narrative, with hindsight and some post-theorisation, gave a more accurate view of gradual changes than feedback after specific interventions would have. This was particularly helpful in a complex, integrated and unfolding context.

What is particularly clear in retrospect is that ongoing participatory dialogue to inform and give feedback on the action process is far more important than formally documented surveys, and that no other research methodology could have adequately informed change of this complexity at this rate.

8.4 Overall conclusion

The dual questions to be addressed in this study were which changes in teaching could facilitate more equitable learning outcomes in a diverse class, and how AR methodology could be used to produce a valid retrospective study. These were both successfully resolved, as described in this paper, which is published in the hope that this learning may benefit those addressing similar challenges.

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