



## **FLUX: Design Education in a Changing World**

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# Testing the effectiveness of student selection

## Abstract

*In South Africa places in higher education programmes are valuable yet perilous for both the students enrolling for studies and for the institutions enrolling the students. For both, any studies which are unsuccessful or not completed are an increasingly costly misuse of time, money, resources and reputation. On the part of the institutions, one of the actions intended to minimize this risk is rigorous student selection.*

*This paper analyzes the effectiveness of the selection methods used by the Industrial Design Department at University of Johannesburg. By comparing the selection assessments of individual applicants with their subsequent performance in the programme, the effectiveness of each of the selection criteria at indicating a likelihood of good (or weak) performance is determined. Some surprising and challenging results emerge.*

*Many of the selection assessment criteria evaluated in this investigation are common to other design disciplines. Applicants are required to submit matriculation subject results; prepare art/design portfolios; present themselves for interview at the institutions.... For design educators who are eager to review their own practice of selection in order to achieve optimal levels of success and throughput, this paper should provide some valuable and useful insights. For those who wish to conduct their own investigation of effectiveness, the method that is described in this paper can also be re-used fairly easily.*

Keywords: *higher education in design  
student selection criteria*

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## Personal reflections and observations

In my own 20 years of teaching design I have been repeatedly challenged and excited by the annual pile of applications for study that arrive at our offices. I have never been sure if too big a pile is fully desirable or not. On the one hand the luxury and re-assurance of having a large pool from which to choose the most suitable; on the other hand the smaller the differences between the shortlisted applications and tougher the choices then become. Educators and administrators responsible for making student selection decisions in any higher education programme are obliged to remember that they answer to the applicant, the teaching institution and the national need for manpower in the choices that they make. In disciplines where performance in Senior Certificate (school leaving) subjects is the proven means of selection these placement decisions are surely easier than in disciplines where selectors are looking for more elusive potential like creativity or flair for design, often not represented in Senior Certificate subjects at all.

## Background

### Government subsidy of higher education graduants

A theme that has consistently appeared in South African Higher Education policy since 1994 is that of throughput improvement. Higher education institutions have been put under pressure to increase the percentage of enrolments that go through to graduation in the minimum allowable time (Higher

Education South Africa, 2007). It is understandable that a developing country, like South Africa, cannot afford to invest in an unproductive teaching system that does not contribute to the production of qualified, competent, usable human capital (Van Lill, 2005:969). The structure of government subsidy calculations favours those programmes with a record of high throughput, taking into account commitments of redress and equity. Also, since 1994, a national revision of the 'landscape' of higher education in the country has led to the re-structuring of many of the higher education institutions and a subsequent rationalisation or confirmation of the programmes and qualifications that they offer. This exercise has further highlighted areas of unproductive or (apparently) inefficient teaching. Programmes with small student numbers, small graduation figures and relatively high staff to student ratios have become particularly aware of these pressures. In design programmes, where the nature of the learning often does require a high level of teaching input and individual attention given to students, educators have been looking hard at how to maximize the productive value of their teaching input with optimal programme design, efficient teaching/learning methods, and appropriate student selection. Inappropriate students who have been selected into a programme and who perform poorly and do not graduate impact negatively on throughput figures, suggest that money has been badly spent and will have used time, space and facilities that should, arguably, have been offered to someone else. At this point I might also remind educators of the consequence of group dynamics, culture and reputation in small learning groups (Favish, 2005:282). How good performing groups stimulate further good performance; and how a poor performing, inappropriate and unmotivated group might demand additional unproductive time and resources; and how these factors might be transferred from one year to the next.

### **The individuals need to graduate**

Seen from the student point of view, or that of their parents or bursars, the time and money invested in learning that does not lead to a qualification is also a waste that most cannot afford. When submitting applications for study, applicants put a certain amount of trust in selection processes to determine their suitability for study in a chosen field. A high level of joblessness in the country and the fear of not being competitive in the job market have intensified the need to get qualified. Furthermore, an academic record of poor performance or failure in a higher education programme could impact negatively on any further application for study.

The question of what constitutes a successful higher education (Camara & Kimmel, 2005:55) is not raised in this paper. It assumes that a completed qualification is a successful one. It could be argued that outcomes like multicultural tolerance and appreciation, or general intellectual interest, or even interpersonal skills, which might not be adequately addressed and assessed for graduation, but have been learned in an uncompleted qualification are more valuable than a completed one without these outcomes. The aim of selection in such a case would not necessarily be to only identify students who are most likely to graduate, in the minimum allowable time.

### **Current student selection methods into industrial design programmes**

The Industrial Design programme at University of Johannesburg (previously at the Technikon Witwatersrand) has, over a period of 25 years, informally monitored and reflected on its use of different criteria and methods for selecting students. Many of these methods were probably inherited from an earlier British (colonial) tradition for acceptance into Art or Design Colleges and, curiously, appear still to be in common use all over the world. Broadly speaking, apart from general university entrance requirements, school leavers considering a career in Industrial Design would need an inherent interest and aptitude (Hunter, 2006) in the visual material realm combined with a flair for practical problem solving. A close relative in this regard would be the field of Architecture. The following list includes frequently used means for assessing applicants for study in this field. Unfortunately no record could be found of their proven accuracy or effectiveness:

- Performance in school leaving subjects
- National or regional standard tests other than school assessments
- Other prior learning
- Submission of a school art portfolio
- Preparation and submission of a prescribed programme specific design portfolio
- Completion of supervised practical exercises
- Written theory/knowledge exercise
- Psychometric tests
- Reports from professional career guidance
- Personal interview

Of these, school subject results and an art portfolio are the most consistently called for, suggesting that these submissions are generally considered to be the most valuable (The Hindu. 2004. Queensland University of Technology. 2005. The University of New South Wales. 2007. Studien- und Berufswahl – Design. 2006. Carnegie Mellon University. 2007. University of Cape Town. 2006). The University of Johannesburg programme has rationalised its requirements to what it believes is manageable, effective and fair. Applicants are required to submit:

School subject results

A record of work experience

A prescribed portfolio that includes a drawing exercise, a design exercise and an essay

The submissions are assessed by a panel of experienced staff and each applicant is rated according to specific criteria. The combined results of the ratings provide the basis on which selection decisions are made. If the submissions do not include enough evidence for a convincing assessment, some of the borderline cases might be invited for an interview before a final decision is made. To date, it had been taken for granted that the selection method has provided appropriate student material because the programme has consistently achieved good throughput figures. A proper investigation into the actual success of selection, considering the individual selection criteria and isolating them from the other factors that contribute to good throughput would be helpful to point out areas for improvement of selection accuracy, and hence, throughput. At the very least, the investigation could confirm the value of the current approach.

### **Method used to determine the value of selection criteria**

The results of the Industrial Design selection assessments since 2001 were retained and made available for the investigation. All the students in two of the entrance year groups (approximately 25 per group) have been used for testing. The programme academic records of each student were drawn to determine an overall performance rating of each. For each student, the selection rating in each of the selection criteria was compared with the performance rating, to assess the predictive accuracy and relative value of each of the criteria. In order to simplify the process, all ratings were quantified as either `Good` 2, `Average` 1 or `Weak` 0. This made it possible to compare one with the other easily, but to a limited extent, in the cases of marginal assessments, might have compromised the accuracy of the results occasionally. Students who deregistered from the programme were assessed as `weak`. Where assessment and performance ratings were the same, a deviation of 0 was recorded. Where ratings differed, the magnitude and `direction` of the deviation was recorded (+1 or -1, or +2 or -2). To determine an overall figure for the predictive accuracy of each criterion the maximum possible deviation per group was calculated, the total of actual deviation (magnitude) was calculated as a percentage of the maximum and the remaining percentage regarded as a final figure for accuracy. The same calculation was done for the portions of the deviation in the upward(+) direction and the downward(-). Furthermore, any pattern of deviation was noted in order to identify other potentially helpful information. Whereas this testing measures selection assessments against performance in the teaching programme, it should be pointed out that a more meaningful measure might be to measure selection assessments against progress after graduating or professional performance (Sharf,2002:28). For the time being, we trust that the content of the programme is sufficiently well constructed to be related to a likelihood of post-graduation performance in the field.

### **Results of the testing of individual selection criteria**

In reviewing the results of each of the tested assessment criteria below it should be noted that a prediction accuracy score of 50% indicates that the selection assessment was the same as the performance just as many times as it was not, making it a very weak or unusable predictor. A score of above 50% indicates a positive predictor and a score of below 50% indicates a negative predictor. Both of latter would be useful in selection. (If it is known, for example, that a good school Geography result predicts bad design performance, this would be a useful negative predictor). The `Performance trend` part of the results explains that students generally tended to perform better or worse in the programme than in the selection assessment. In this regard, `better` indicates a safer predictor than `worse`. It should ideally show a balance of better and worse trends, or neither. An overwhelming trend in either direction would suggest that the standards of selection assessment be reviewed. The

last part of the results is a short paragraph of, hopefully useful, comment on the particular assessment criterion as a whole.

### **Matriculation (Senior Certificate) score**

Prediction accuracy: 65%

Performance trend: Worse

Matriculation score, or `M-Score`, is a calculation of overall performance in school leaving subjects. University of Johannesburg uses M-Score requirements at the first level of screening for entrance into programmes, making it particularly convenient to administer. Matriculation tests are nationally standardized and controlled, giving no unfair advantage to any applicant from within the borders.

An interesting tendency in the performance and M-Score relationship was that the most consistent good performance in the programme was achieved in the M-Score category of 15 to 18 (Typically, `B` and `C` matriculation symbols). In the top M-Score category of 18 to 30 (Typically, matriculation results that include a few `A` symbols) performance in the programme was notably erratic. Either well above average, or particularly weak. I would suggest that this phenomenon be investigated further to establish, if possible, what the reasons are. One would assume that students who excel at school should warrant being more accurately placed in higher education.

### **Matriculation Art**

Prediction accuracy: 63%

Performance trend: Worse

Surprisingly, the school art subject turns out not to be a particularly good predictor. Furthermore, performance, when different, tended to be worse in the design programme than in school art. Are design educators adequately aware of the purpose and expected outcomes of school art and how these relate to design disciplines? School art teachers might not be the most suitable avenue for marketing design programmes.

### **Matriculation Mathematics**

Prediction accuracy: 66%

Performance trend: None

Plato suggested that aesthetics is based on logical and mathematical rules... An increasing use of computers in the design environment could explain the need for an ability to deal with mathematical geometry and arithmetic (Ozcan & Akarun, 2001:26).

### **Matriculation Science**

Prediction accuracy: 59%

Performance trend: Worse

(I had hoped that the `investigative` and `logic` abilities of a scientific mind should indicate design potential) This level and trend of prediction accuracy is not recommended.

### **Matriculation English**

Prediction accuracy: 59%

Performance trend: Worse

### **Portfolio drawing exercise**

Prediction accuracy: 65%

Performance trend: Worse (All)

The portfolio exercise required applicants to draw from life. It has an observation and a skill component. Experienced or trained applicants (those who had done art at school) generally fared better in the selection assessment than those who had not.

### **Portfolio design exercise**

Prediction accuracy: 69%

Performance trend: None

To a certain extent, this exercise requires that applicants have an understanding of what design is. Applicants from schools in metropolitan areas, having seen more man-made (designed) things and having heard or read more about design, have an advantage over applicants from rural schools. Educators should remind themselves that more than 70% of South Africans live rurally, and that some of this living is *extremely* rural.

### Portfolio construction and presentation

Prediction accuracy: 71%

Performance trend: Better

The relatively high predictive accuracy could lie in the testing of user-sensitivity (sensitivity to the reviewers for whom it has been prepared), communication design (in the layout and sequencing) and construction design inherent in the task. These factors are fundamental to almost all good product design. In this sense, the inherent or instinctive design ability of an applicant is being reviewed. As in the previous criterion, metropolitan applicants appear to have an advantage. Socio-economic circumstances need to be taken into account.

### Maturity and motivation

Prediction accuracy: 79%

Performance trend: None

To make the assessment, assessors considered age, life experience, signs of self-determination, level of communication (adult to adult), understanding of the field, portfolio thoroughness and timeliness of the application.

## Conclusions, recommendations to the Department of Industrial Design at University of Johannesburg

Conclusion	Recommendation
All of the current criteria used by the department are positive predictors. Their combined use would be valid for selection purposes. Some of the criteria are significantly better predictors than others.	In final assessments, relate the weighting (importance) of the criteria to their prediction accuracy. The combined use of the criteria should then provide better results. Introduce new (experimental) criteria and systematically retain selection assessment results for effectiveness testing. Test a variety of different combinations of criteria against performance.
Maturity and motivation (as interpreted and assessed by the department) appear to be a particularly good predictor.	This criterion should be given a high weighting for selection. The means of determining the assessment could also be expanded. The value of personal interviews could be considered. Information brochures to prospective students could be configured to encourage such applicants.
Portfolio construction and presentation are good predictors.	It would be worth investigating the apparent success of this criterion further, bearing in mind points mentioned in the results paragraph above. Retain all the portfolio criteria. Including drawing and English/language (communication) in the design exercise. In the current configuration, where they are not related to design, their value as predictors is questionable. Reinforce the notion that this is in fact a real design exercise.
Portfolio design exercise should be a stronger predictor.	The department should revise their prescribed exercises.
Matriculation score and matriculation mathematics are guardedly useful predictors.	Apply these results of individual applicants carefully. They need to be supported by good results in the other criteria. Confirm their validity in relation to changing programme content. In their own right, these are not good predictors.
Portfolio drawing and Matriculation Art results are weak predictors.	Even though instinct and tradition might incline selectors not to do so, give these criteria a low weighting.
Matriculation English and Science results are very weak predictors	Seek out the minimum standard only for each. Adjust this minimum standard in relation to changing academic content of the programme when necessary.

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1972            Matric. Pretoria Boys High (Distinctions Maths, Science, German)  
1983            N.Dip: Industrial Design. Technikon Witwatersrand  
1992            M Dip Tech: Industrial Design. Technikon Witwatersrand  
*(Title: Design of a multifunctional pushchair for handicapped children)*

**Employment / Commercial Activities:**

1984-7            Designer at ROGER WILLIAMS ASSOCIATES Industrial design consultants

1987-present    Lecturer, Snr. Lecturer, Head of Industrial Design and Head of Product Design at TECHNIKON WITWATERSRAND.

Currently Snr Lecturer in Industrial Design at University of Johannesburg

Part time design consulting

Solo and joint Exhibitions of explorative designer/maker works

**Achievements:**

Maths Olympiad final round 1972  
Style Design awards 1990 & 1999  
Elle Decoration International Seating Design Award 2003  
Paraffin Safety Association stove design winner 2004  
Carrol Boyes Metal design 2nd place 2005  
Northern Transvaal mountain biking colours 1995



# Testing the effectiveness of student selection

## Abstract

*In South Africa places in higher education programmes are valuable yet perilous for both the students enrolling for studies and for the institutions enrolling the students. For both, any studies which are unsuccessful or not completed are an increasingly costly misuse of time, money, resources and reputation. On the part of the institutions, one of the actions intended to minimize this risk is rigorous student selection. This paper analyzes the effectiveness of the selection methods used by the Industrial Design Department at University of Johannesburg. By comparing the selection assessments of individual applicants with their subsequent performance in the programme, the effectiveness of each of the selection criteria at indicating a likelihood of good (or weak) performance is determined. Some surprising and challenging results emerge. Many of the selection assessment criteria evaluated in this investigation are common to other design disciplines. Applicants are required to submit matriculation subject results; prepare art/design portfolios; present themselves for interview at the institutions.... For design educators who are eager to review their own practice of selection in order to achieve optimal levels of success and throughput, this paper should provide some valuable and useful insights. For those who wish to conduct their own investigation of effectiveness, the method that is described in this paper can also be re-used fairly easily.*

# Background

- **Government subsidy of higher education**
- **The individuals need to graduate**
- **Current selection methods into Industrial Design programmes:**
  - school subject performance
  - standard tests
  - prior learning
  - school art portfolio
  - prescribed portfolio
  - supervised practical and theory exercises
  - interview
  - psychometric tests
  - career guidance reports
- **UJ Industrial Design selection submissions:**
  - school subject results
  - work experience
  - prescribed portfolio (drawing, design, essay)

## Method used to determine the value of selection criteria

- Record selection assessments 2001, 2002 entrance yeargroups
- Compare selection ratings in each of the selection criteria with the subsequent performance of the student in the programme
- Measure the accuracy with which each selection rating predicted performance in the programme

## Results of the testing of individual selection criteria

- **Matriculation score**                      **65% accurate**
- **Matric Art**                                      **63%**
- **Matric Maths**                                  **63%**
- **Matric Science**                                **59%**
- **Matric English**                                **59%**
- **Portfolio drawing exercise**                **65%**
- **Portfolio design exercise**                 **69%**
- **Portfolio construction/design**            **71%**
- **Maturity and motivation**                   **79%**

## Conclusions

- Each of the criteria tested is a positive predictor. Some of the criteria are significantly better predictors than others
- `Maturity and motivation` appears to be a particularly good predictor
- `Portfolio construction/design` is a good predictor
- `Portfolio design exercise` is a good predictor
- `Matriculation score` and Mathematics are guardedly useful predictors
- `Portfolio drawing exercise` and Matric Art are weak predictors
- Matric English and Science are very weak predictors

Thank you