

"Educating the Future Mining Engineering Practitioner"

*Department of Mining Engineering
University of Pretoria
Laureate Winner 2010*

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University of Pretoria

**Society of Mining Professors (SOMP) Conference
Arequipa
September 2011**



*Students don't care about how much
you know until they know how much you care*

Colorado school of Mines

A 'Profile of the Future Graduate' which was approved in 1994. Attributes which they want to foster in every graduate are: Technical competence, Communication skills (Written, oral, graphical), The ability to work in diverse teams, Life-long learning, the awareness of the impacts of non-technical influences, integrity and self-discipline

Summary of challenges - 5 focus areas identified



Professional skills

Support

Communicate

Teaching

Content

Summary of challenges - 5 focus areas identified

Content

- No or little mining experience from students
- New concepts and terminology not visualised and explained
- Students specialize in mining engineering from the third year only

Professional Skills

- Management and leadership principles - not addressed in curriculum

Support

- No mentoring and coaching of individuals and teams
- Pass rates in modules low due to lack of understanding

Summary of challenges - 5 focus areas identified

Communication

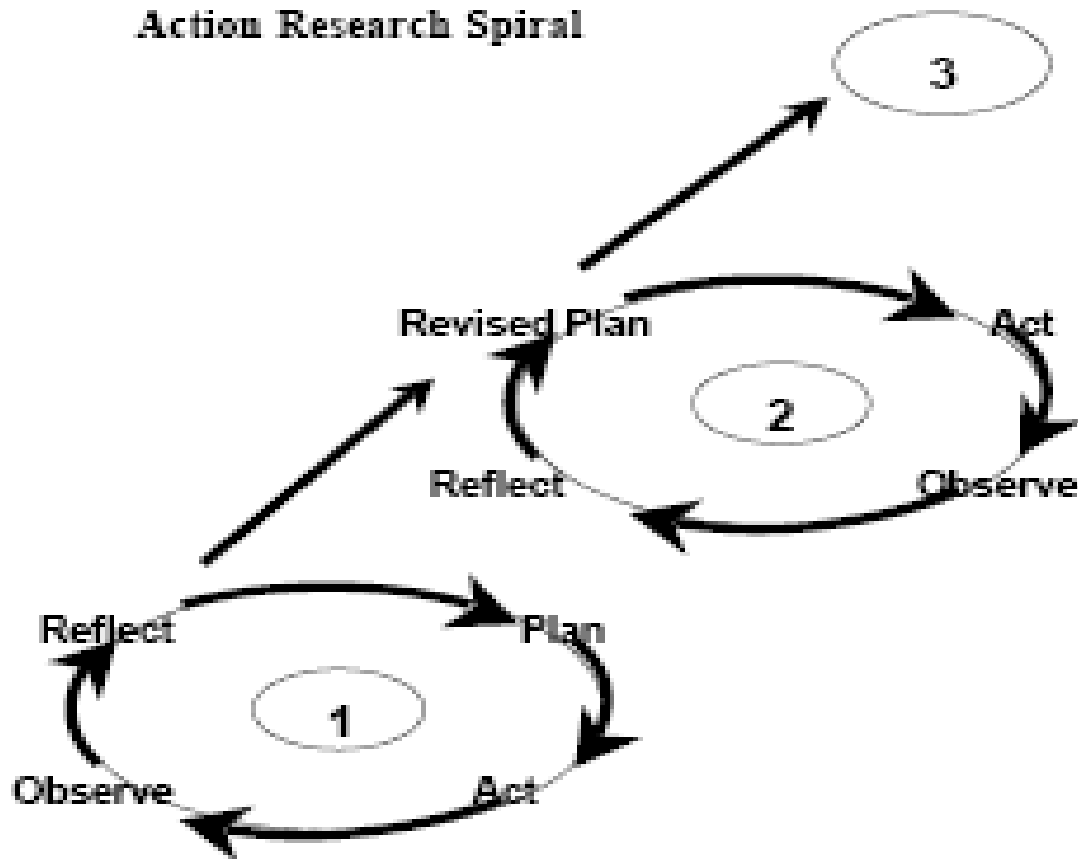
- Increase in student numbers (multi language environment)
- Lecturers feedback reports from students good but not great

Teaching

- Higher student numbers made mine visits more difficult
- Class attendance poor - different approach for large classes
- Group selection not done scientifically
- Reason for failure/success of groups not "measured"

Holistic approach to teaching and learning

Action research process



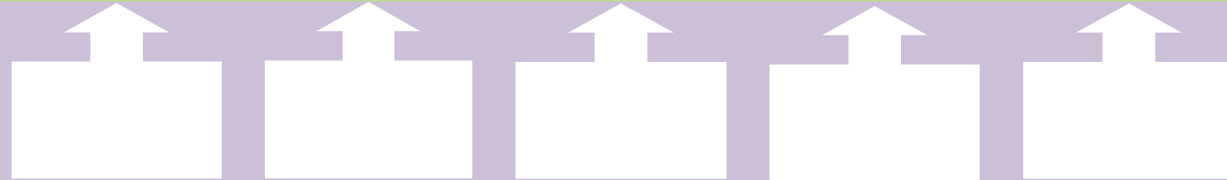
The figure represents the typical action research spiral of planning, acting on the plan, observing the action, reflecting on the results, and creating a revised plan.

The development process of innovative teaching and learning for the mining engineering qualification

AIM: Mine Engineering Practitioner



PHASE 3: FUTURE



PHASE 2: CURRENT



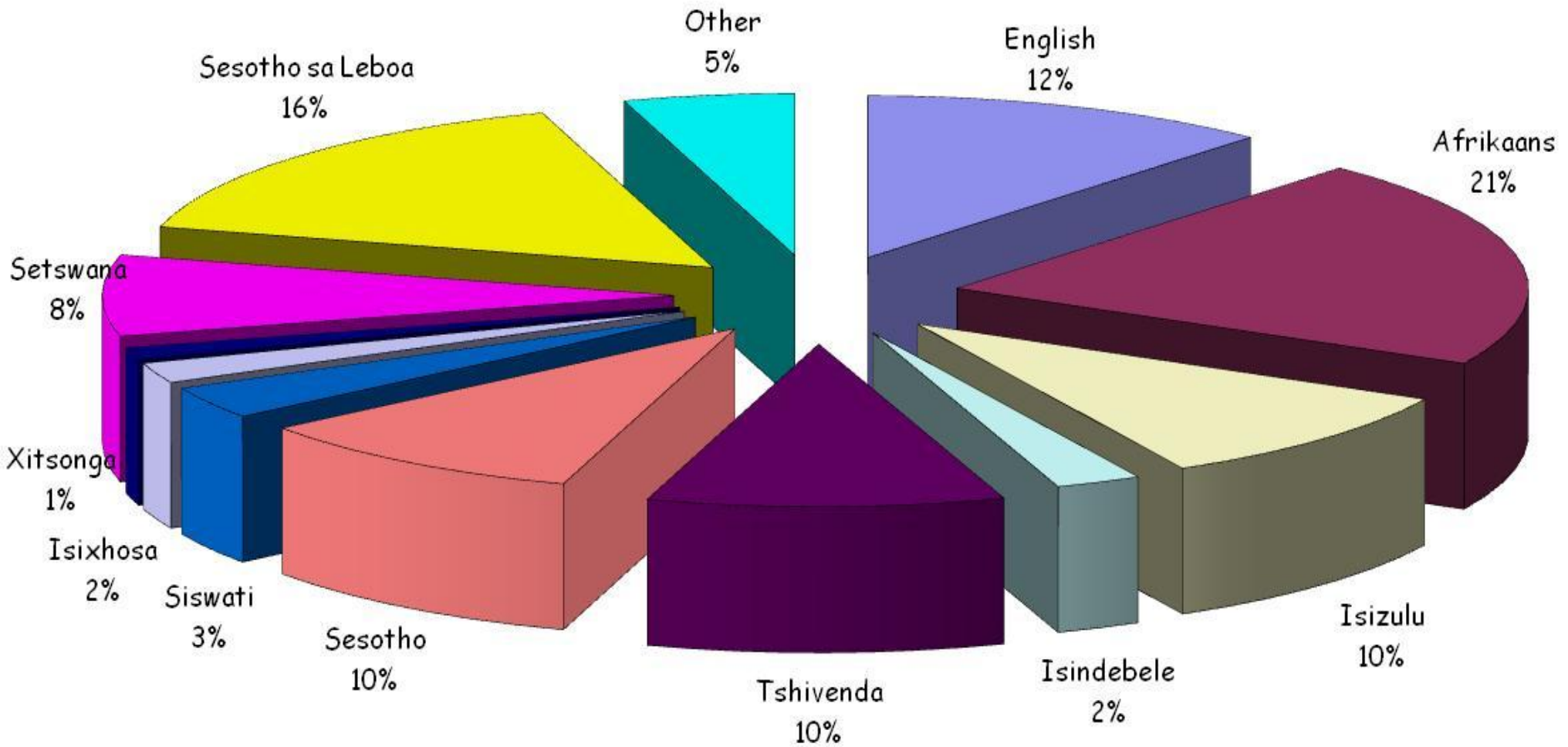
PHASE 1: PREPARATION

ECSA STANDARDS

SAQA OUTCOMES



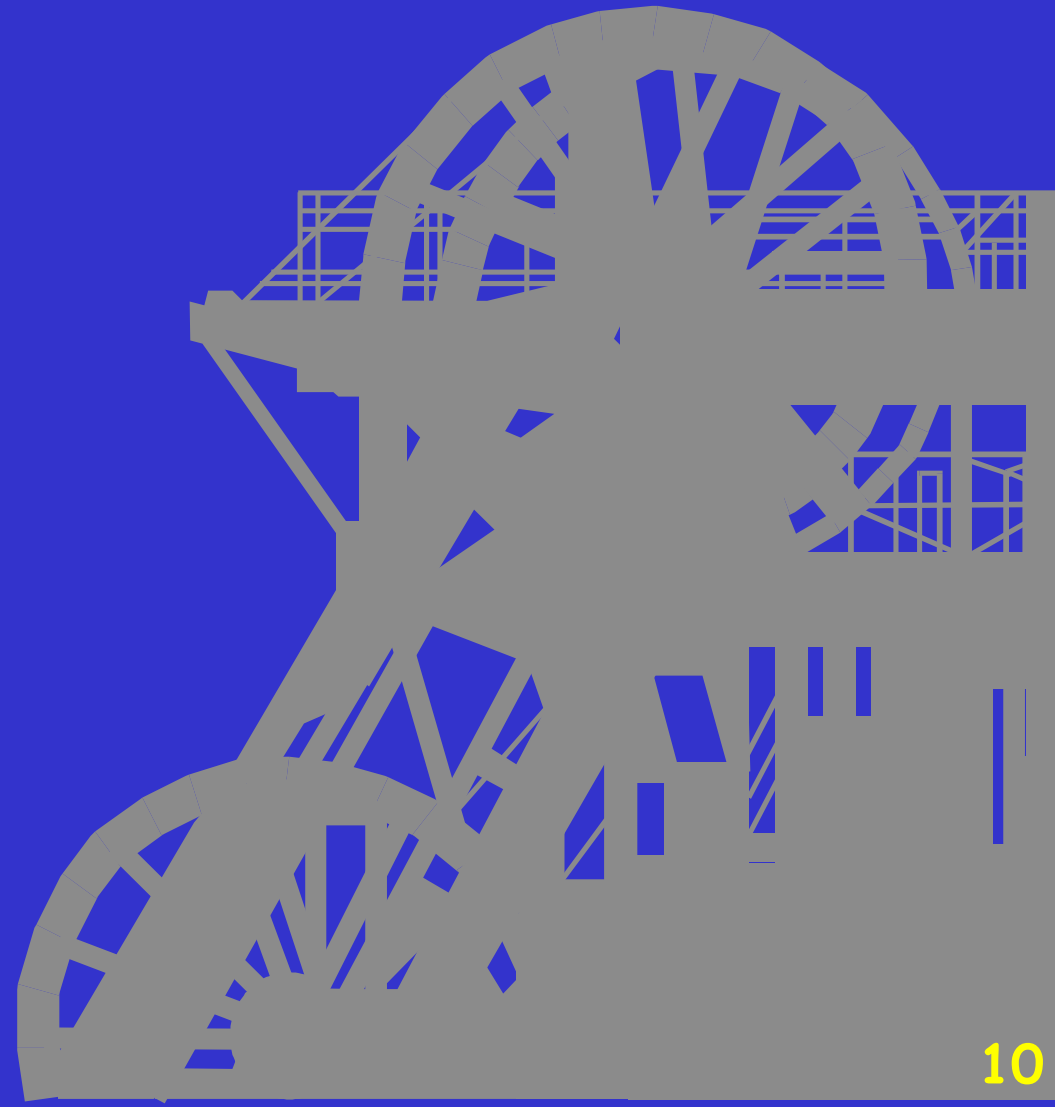
Department of Mining Engineering
University of Pretoria
Language distribution all students 2011



Interventions

Content

Why instructional design



Interventions

Professional skills

- HBDI, Shadowmatch, EQ, Myers Briggs, DISC



35 Individuals

UPPER LEFT

Upper Mode

UPPER RIGHT

factual
quantitative
critical
rational
mathematical
logical
analytical

A

imaginative
artistic
intuitive
holistic
synthesiser
simultaneous
spatial

D

Max: 125
Min: 53

104 :Max
38 :Min

Left Mode

Right Mode

Min: 38
Max: 113

21 :Min
90 :Max

conservative
controlled
sequential
detailed
dominant
speaker
reader

B

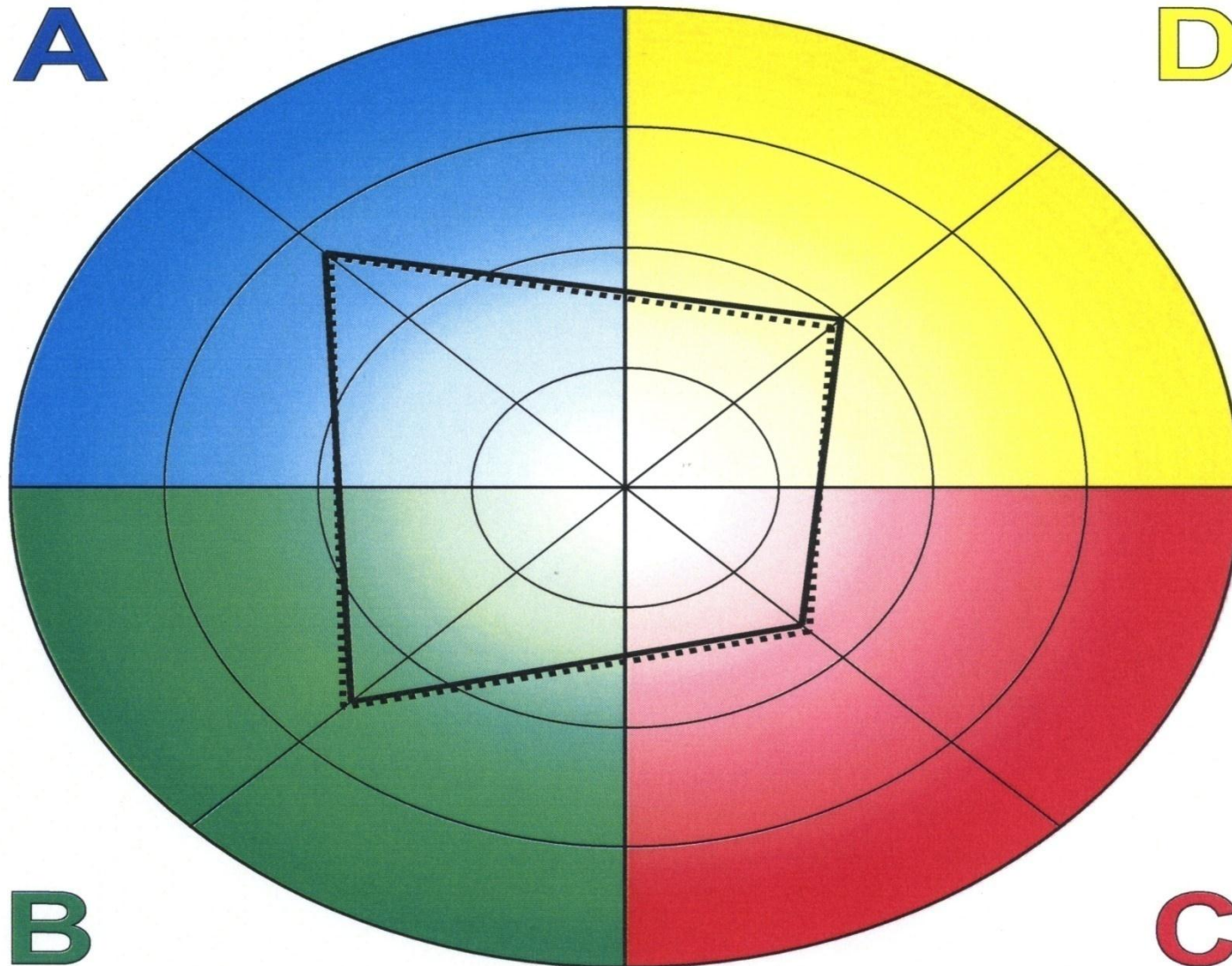
emotional
musical
spiritual
symbolic
intuitive
talker
reader

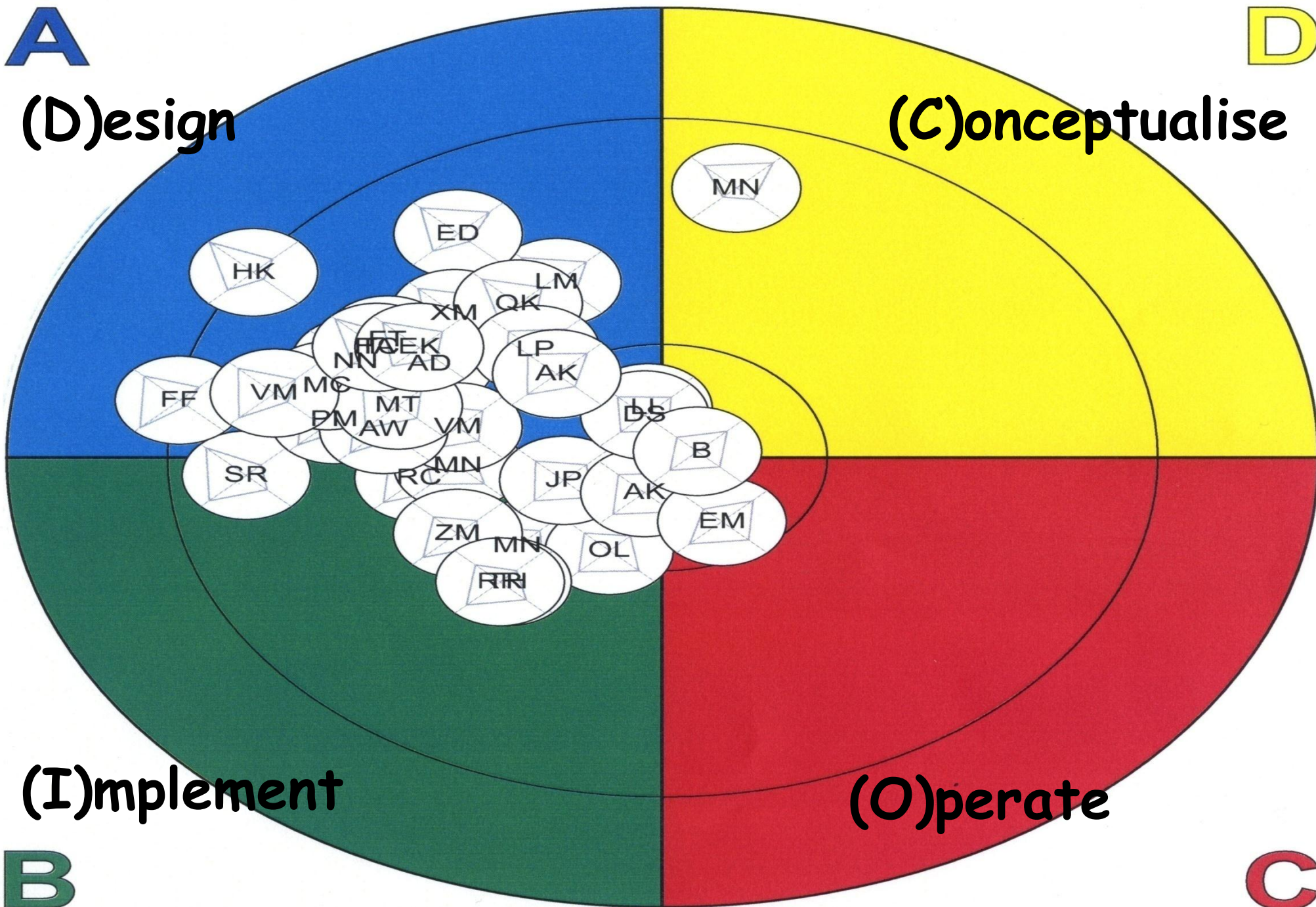
C

LOWER LEFT

Lower Mode

LOWER RIGHT



A**(D)esign****D****(C)onceptualise****B****(I)mplement****C****(O)perate**

ACTIVE

D = DOMINANCE

I = INFLUENCE

FOCUS :

Power

KEY WORDS (HI)

: Driving, Competitive, Forceful, Inquisitive, Direct, Self-starter, Assertive

(LO)

: Mild, Indecisive, Non-demanding

COMMUNICATING STYLE: Tell
MANAGERIAL STYLE: Autocratic
MOTIVATOR: Tangible Goals
FEAR: Failure
QUESTION: What?
ENGAGE: Force of Character

FOCUS :

People

KEY WORDS (HI)

: Influential, Friendly, Persuasive, Verbal, Communicative, Positive

(LO)

: Self-conscious, Serious, Reserved, Reflective, Suspicious, Probing

COMMUNICATING STYLE: Sell
MANAGERIAL STYLE: Democratic
MOTIVATOR: Recognition & Social Inclusion
FEAR: Rejection
QUESTION: Who?
ENGAGE: Personality

ANTAGONISTIC

FAVOURABLE

FOCUS :

Policy

KEY WORDS (HI)

: Careful, Compliant, Precise, Logical, Perfectionist, Systematic, Accurate

(LO)

: Firm, Persistent, Stubborn, Independent, Strong-willed

COMMUNICATING STYLE: Write
MANAGERIAL STYLE: Unpredictable
MOTIVATOR: Job Specification & Rules
FEAR: Conflict
QUESTION: How?
ENGAGE: Know-How

FOCUS :

Face

KEY WORDS (HI)

: Dependable, Deliberate, Good Listener, Amiable, Kind, Persistent

(LO)

: Mobile, Alert, Active, Eager, Demonstrative, Restless

COMMUNICATING STYLE: Listen
MANAGERIAL STYLE: Procedural
MOTIVATOR: Job Contract & Group Inclusion
FEAR: Insecurity
QUESTION: Why?
ENGAGE: Experience

C = COMPLIANCE

PASSIVE

S = STEADINESS

The Myers-Briggs Type Indicator

(try things out, focus on the outer world of people)

or

(I)ntroverts

(think things through, focus on the inner world of ideas)

(practical, detail-oriented, focus on facts and procedures)

or

i(N)tuitors

(imaginative, concept-oriented, focus on meanings and possibilities)

(skeptical, tend to make decisions based on logic and rules)

or

(F)eelers

(appreciative, tend to make decisions based on personal and humanistic considerations)

(set and follow agendas, seek closure even with incomplete data)

or

(P)erceivers

(adapt to changing circumstances, resist closure to obtain more data).

Groups to be made up of at least one of each of the following combinations:

(IS or IT) + (EN or EF) + (ET or ES) + (other combinations)

PERSON

**SUCCESSFULLY
MATCHED**

TASK

CONTEXT

Emotional Intelligence (EQ)

*"Emotional Intelligence (EQ) is defined as (one of many definitions):
The capacity for recognising and understanding our own emotional reactions
AND those of others,
for motivating ourselves, and
for managing emotions well in ourselves AND in our relationships"*

(Daniel Coleman)

Interventions

Support

- Mentoring and coaching (CAR principle, Consult/discuss, Action, Reflection).
- Financial support to non bursary needy students (caring), industry funded
- Personal development program

Communication

- All academic **announcements** are communicated through ClickUP
- Read-on English program for all students in final year as well
- Bulk SMS system introduced by the Department
- Continuous feedback on progress
- Reflections on subject content continuously

Instructional design

(Estelle Drysdale & Nitha Olivier)

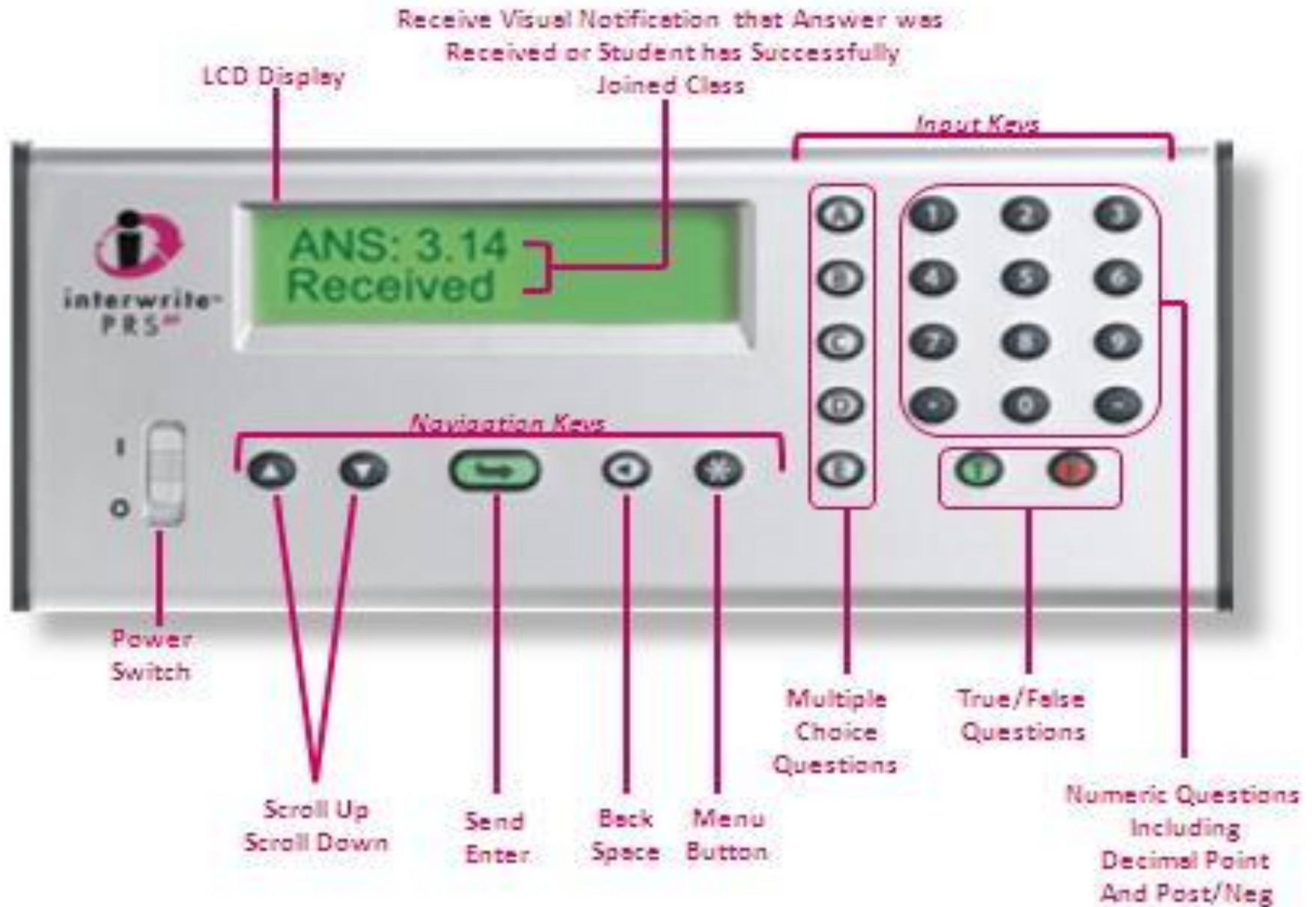
- The process we follow is according to the ADDIE Instructional design model:
- **A - analysis** - read through the notes
- **D - design** - identify the media elements
(lecturers must source the media elements)
- **D - development** - lecturers approve the suggested media elements and it is then build into the MS Word documents before it is PDF
- **I - implementation** - links will be build in PDF documents
- **E - evaluation** - lecturers need to work through the documents to verify that all the included elements are correct. An external user should also test each and every link to ensure that all is working as it should.

Interventions

Teaching

- Lecturers HBDE to change lecturing approach
- Group selection tools to improve group work dynamics
- In depth team mentoring and coaching sessions
- Instant lecture feedback through Clickers (radio based response)

Inter-write Personal Response System (PRS)



Effect of Interventions

- Higher pass rates in mining subjects
- Students now starts to take responsibility for their own actons
- Student engagement, as well as preparedness for class
- Class attendance and class participation has improved (clicker use)
- The average feedback score from students for the lecturers improved
- The process of improvement is sustainable, supported by the HOD and lecturers
- This new holistic interactive virtual reality multimedia approach well received by industry/alumni

Conclusions

- A higher pass percentage per final year group compared to previous years
- A much more happier student group
- Students much more involved with their academic program
- Students better prepared for classes
- Overall improvement towards their choice of career
- Students understanding themselves better
- The "product" that we send out to industry better equipped to meet the challenges that they will face
- We strongly believe that we now a competitive edge in terms of what other mining schools in the world are offering

Acknowledgements

- My colleagues at the Department of Mining Engineering University of Pretoria who believes in the project and continuously improve it
- The Department of Web and Multimedia, Tshwane University of Technology
- Dr Ronel Callaghan for her continued support and believing in what we are doing
- Estelle Drysdale and Nitha Olivier for instructional design contribution
- Erna Gerrys for HBDI, Shadowmatch and EQ student support in department
- Simulated Training Solutions (STS) for simulations



Questions?