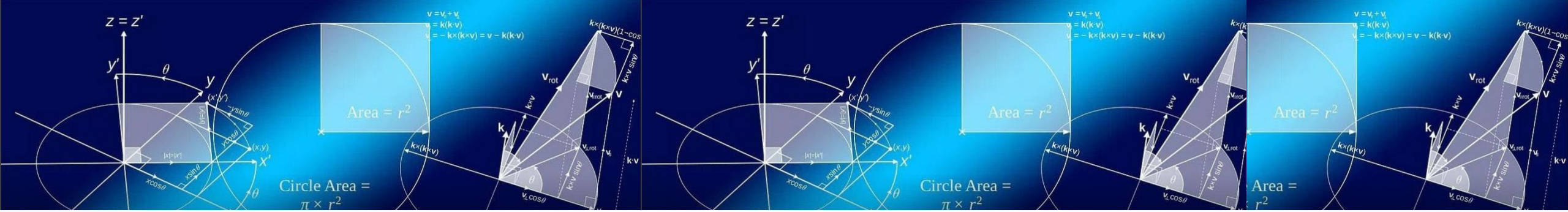


DIAGNOSTIC MATHEMATICS INFORMATION FOR STUDENT RETENTION AND SUCCESS (DMISRS) PROJECT

ROBERT PRINCE

8TH JULY 2019

cetap.uct.ac.za

CETAP
Centre for Educational Testing for Access and Placement

dmisrs.co.za

WELCOME TO

The Diagnostic Mathematics Information for Student Retention and Success (DMISRS) Symposium

2019

MATHEMATICS in PRACTICE

MALAWI

Wider access to higher education needs a mindset shift

Steve Sharra 06 July 2018 Issue No:513

Has teaching in higher education become redundant?

Wafa Singh 06 July 2018 Issue No:513

THE CHRONICLE
of Higher Education

TEACHING

When Your Course Suddenly Needs an Overhaul

JULY 05, 2018

GLOBAL

Engaging and retaining students through video capture

Linda Storey 06 July 2018 Issue No:513

HOW PEOPLE LEARN
BRAIN, MIND, EXPERIENCE, AND SCHOOL

1. **STUDENTS COME TO THE CLASSROOM WITH PRECONCEPTIONS ABOUT HOW THE WORLD WORKS. IF THEIR INITIAL UNDERSTANDING IS NOT ENGAGED, THEY MAY FAIL TO GRASP THE NEW CONCEPTS AND INFORMATION THAT ARE TAUGHT, OR THEY MAY LEARN THEM FOR PURPOSES OF A TEST BUT REVERT TO THEIR PRECONCEPTIONS OUTSIDE THE CLASSROOM.**

TEACHERS MUST DRAW OUT AND WORK WITH THE PREEXISTING UNDERSTANDINGS THAT THEIR STUDENTS BRING WITH THEM.

HOW PEOPLE LEARN
BRAIN, MIND, EXPERIENCE, AND SCHOOL

2. TO DEVELOP COMPETENCE IN AN AREA OF INQUIRY, STUDENTS MUST:

(a) HAVE A DEEP FOUNDATION OF FACTUAL KNOWLEDGE,

(b) UNDERSTAND FACTS AND IDEAS IN THE CONTEXT OF A CONCEPTUAL FRAMEWORK, AND

(c) ORGANIZE KNOWLEDGE IN WAYS THAT FACILITATE RETRIEVAL AND APPLICATION.

TEACHERS MUST TEACH SOME SUBJECT MATTER IN DEPTH, PROVIDING MANY EXAMPLES IN WHICH THE SAME CONCEPT IS AT WORK AND PROVIDING A FIRM FOUNDATION OF FACTUAL KNOWLEDGE

HOW PEOPLE LEARN
BRAIN, MIND, EXPERIENCE, AND SCHOOL

3. A "METACOGNITIVE" APPROACH TO INSTRUCTION CAN HELP STUDENTS LEARN TO TAKE CONTROL OF THEIR OWN LEARNING BY DEFINING LEARNING GOALS AND MONITORING THEIR PROGRESS IN ACHIEVING THEM.

THE TEACHING OF METACOGNITIVE SKILLS SHOULD BE INTEGRATED INTO THE CURRICULUM IN A VARIETY OF SUBJECT AREAS.

LEARNING THEORY

- LEARNING THEORY DOES NOT PROVIDE A SIMPLE RECIPE FOR DESIGNING EFFECTIVE LEARNING ENVIRONMENTS; SIMILARLY, PHYSICS CONSTRAINS BUT DOES NOT DICTATE HOW TO BUILD A BRIDGE (E.G., SIMON, 1969).

- NEVERTHELESS, NEW DEVELOPMENTS IN THE SCIENCE OF LEARNING RAISE IMPORTANT QUESTIONS ABOUT THE DESIGN OF LEARNING ENVIRONMENTS—QUESTIONS THAT SUGGEST THE VALUE OF RETHINKING WHAT IS TAUGHT, HOW IT IS TAUGHT, AND HOW IT IS ASSESSED.

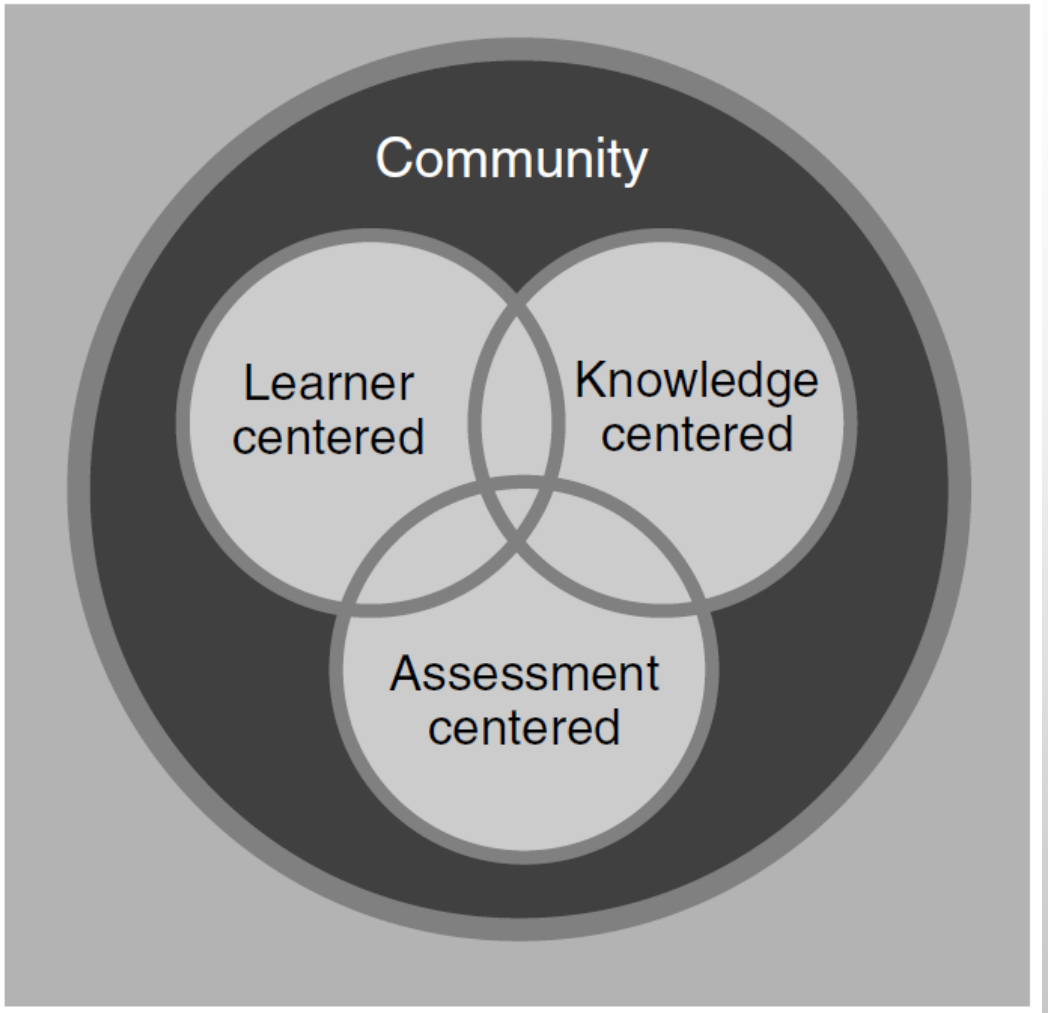


FIGURE 6.1 *Perspectives on learning environments. SOURCE: Bransford et al. (1998).*

LEARNER CENTERED

- A FOCUS ON THE DEGREE TO WHICH ENVIRONMENTS ARE LEARNER CENTERED IS CONSISTENT WITH THE STRONG BODY OF EVIDENCE SUGGESTING THAT LEARNERS' USE THEIR CURRENT KNOWLEDGE TO CONSTRUCT NEW KNOWLEDGE AND THAT WHAT THEY KNOW AND BELIEVE AT THE MOMENT AFFECTS HOW THEY INTERPRET NEW INFORMATION.
- SOMETIMES LEARNERS' CURRENT KNOWLEDGE SUPPORTS NEW LEARNING, SOMETIMES IT HAMPERS LEARNING: EFFECTIVE INSTRUCTION BEGINS WITH WHAT LEARNERS BRING TO THE SETTING; THIS INCLUDES CULTURAL PRACTICES AND BELIEFS AS WELL AS KNOWLEDGE OF ACADEMIC CONTENT.
- LEARNER-CENTERED ENVIRONMENTS ATTEMPT TO HELP STUDENTS MAKE CONNECTIONS BETWEEN THEIR PREVIOUS KNOWLEDGE AND THEIR CURRENT ACADEMIC TASKS.

KNOWLEDGE CENTERED

- AN EMPHASIS ON BEING KNOWLEDGE CENTERED RAISES A NUMBER OF QUESTIONS, SUCH AS THE DEGREE TO WHICH INSTRUCTION BEGINS WITH STUDENTS' CURRENT KNOWLEDGE AND SKILLS, RATHER THAN SIMPLY PRESENTS NEW FACTS ABOUT THE SUBJECT MATTER.
- A KNOWLEDGE-CENTERED PERSPECTIVE ON LEARNING ENVIRONMENTS ALSO HIGHLIGHTS THE IMPORTANCE OF THINKING ABOUT DESIGNS FOR CURRICULA.
- TO WHAT EXTENT DO THEY HELP STUDENTS LEARN WITH UNDERSTANDING VERSUS PROMOTE THE ACQUISITION OF DISCONNECTED SETS OF FACTS AND SKILLS?

ASSESSMENT CENTERED

- FEEDBACK IS FUNDAMENTAL TO LEARNING, BUT OPPORTUNITIES TO RECEIVE IT ARE OFTEN SCARCE IN CLASSROOMS.
- STUDENTS MAY RECEIVE GRADES ON TESTS AND ESSAYS, BUT THESE ARE SUMMATIVE ASSESSMENTS THAT OCCUR AT THE END OF PROJECTS;
- ALSO NEEDED ARE FORMATIVE ASSESSMENTS THAT PROVIDE STUDENTS OPPORTUNITIES TO REVISE AND HENCE IMPROVE THE QUALITY OF THEIR THINKING AND LEARNING.
- ASSESSMENTS MUST REFLECT THE LEARNING GOALS THAT DEFINE VARIOUS ENVIRONMENTS.

COMMUNITY CENTERED

- IDEALLY, STUDENTS, TEACHERS, AND OTHER INTERESTED PARTICIPANTS SHARE NORMS THAT VALUE LEARNING AND HIGH STANDARDS.
- NORMS SUCH AS THESE INCREASE PEOPLE'S OPPORTUNITIES TO INTERACT, RECEIVE FEEDBACK, AND LEARN.
- THERE ARE SEVERAL ASPECTS OF COMMUNITY, INCLUDING THE COMMUNITY OF THE CLASSROOM, THE SCHOOL, AND THE CONNECTIONS BETWEEN THE SCHOOL AND THE LARGER COMMUNITY, INCLUDING THE HOME.
- THE IMPORTANCE OF CONNECTED COMMUNITIES BECOMES CLEAR WHEN ONE EXAMINES THE RELATIVELY SMALL AMOUNT OF TIME SPENT IN SCHOOL COMPARED TO OTHER SETTINGS.

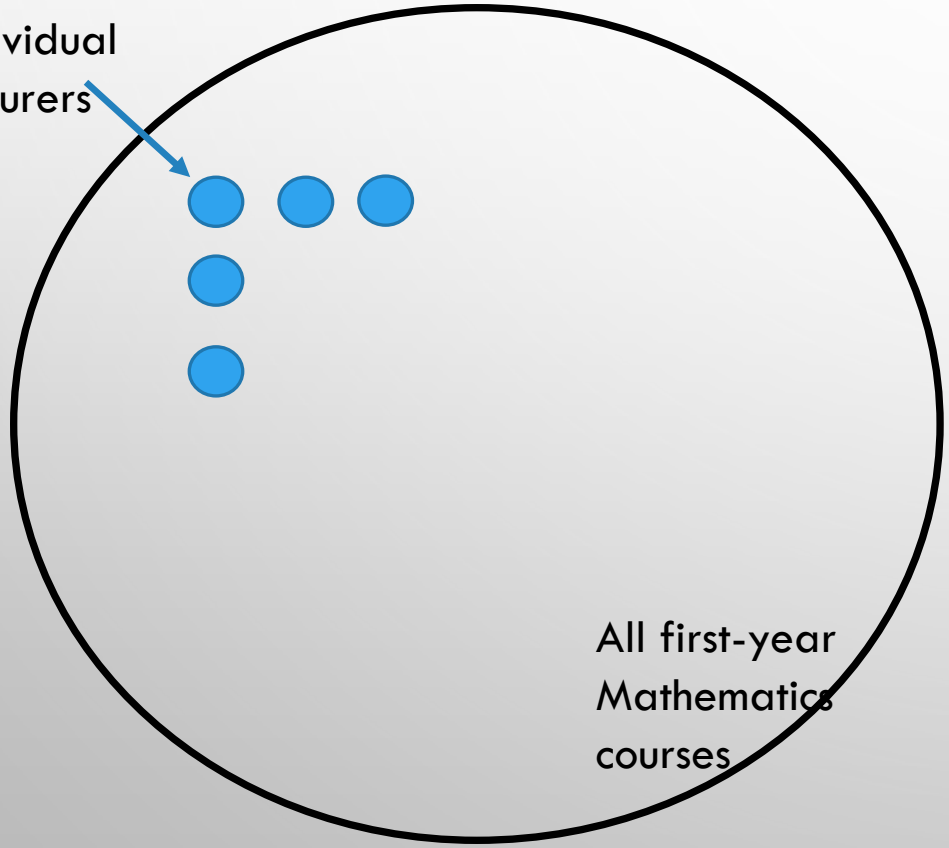
ALIGNMENT

- FINALLY, THERE NEEDS TO BE ALIGNMENT AMONG THE FOUR PERSPECTIVES OF LEARNING ENVIRONMENTS.
- THEY ALL HAVE THE POTENTIAL TO OVERLAP AND MUTUALLY INFLUENCE ONE ANOTHER.
- ISSUES OF ALIGNMENT APPEAR TO BE VERY IMPORTANT FOR ACCELERATING LEARNING BOTH WITHIN AND OUTSIDE OF SCHOOLS.

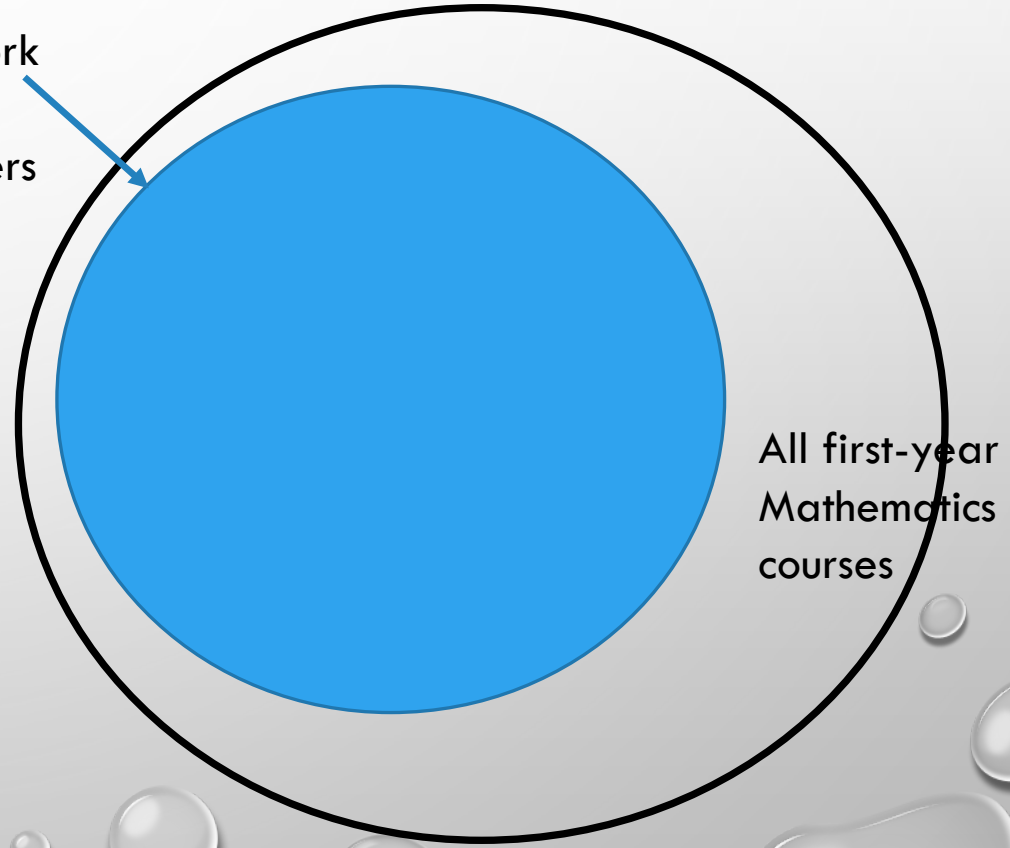
The role of DMISRS in the national Mathematics landscape

COLLABORATION

A very small impact



Quite a large impact



A.

- ENGAGE WITH MATHEMATICS DIAGNOSTIC INFORMATION. THE ANALYSIS OF THIS, AS WELL AS AN OVERVIEW OF CURRENT CURRICULUM-INTEGRATED SUPPORT INITIATIVES AT HEI, COULD BE THE FOCUS OF PRESENTATIONS TO HIGHER EDUCATION INSTITUTIONS.

B.

- **THE OUTCOME** OF THESE ENGAGEMENTS AND PRESENTATIONS WOULD BE THAT INSTITUTIONS WOULD BE PERSUADED TO REFLECT ON THEIR PRACTICES AND USE THE DIAGNOSTIC INFORMATION AS A TOOL FOR PLACEMENT AND SUPPORT AS WELL ESTABLISHING THE CURRICULUM-INTEGRATED SUPPORT INITIATIVES IDENTIFIED. MORE IMPORTANTLY THIS INFORMATION WILL DETERMINE THE TYPE AND EXTENT OF THE CURRICULUM-INTEGRATED SUPPORT THAT COULD BE IMPLEMENTED.

C.

- THE **IMMEDIATE INSTITUTIONAL BENEFIT** SHOULD BE THAT THE INITIAL (BASELINE) SURVEY OF CURRICULUM-INTEGRATED SUPPORT FOR MATHEMATICS WOULD PROVIDE A PLATFORM FOR INTEGRATING OTHER FORMS OF SUPPORT, SUCH AS BLENDED LEARNING. COMPREHENSIVE INFORMATION REGARDING CURRICULUM-INTEGRATED SUPPORT INITIATIVES SHOULD GUIDE INSTITUTIONS INTO MAKING BETTER DECISIONS AS TO HOW BEST TO SUPPORT AND ENHANCE THE EXPERIENCE OF THEIR FIRST-YEAR STUDENTS. THROUGH A COLLABORATIVE PROGRAMME, ACADEMICS, WILL BE ENCOURAGED TO MAKE EVIDENCE-BASED DECISIONS FOR CURRICULUM CHANGE TO ENHANCE STUDENT SUCCESS.

D.

- THE PRIMARY **LONG-TERM OBJECTIVE** WOULD BE THE BENEFIT, TO STUDENTS, INSTITUTIONS AND THE HIGHER EDUCATION SECTOR AS A WHOLE, ENHANCING CURRICULUM SUPPORT IN MATHEMATICS TO INCREASE STUDENT PARTICIPATION AND SUCCESS IN MATHEMATICS. FROM A TRANSFORMATION VIEWPOINT THIS PROJECT HAS THE POTENTIAL TO CHANGE THE PROFILE OF STUDENTS SUCCEEDING IN MATHEMATICS. HEI EMPOWERED WITH EXTENSIVE KNOWLEDGE OF CURRICULUM-INTEGRATED SUPPORT INITIATIVES SHOULD BE IN A POSITION TO ENHANCE THE FIRST-YEAR EXPERIENCE, AND REDUCE ATTRITION.

FUNDING FOR:

- MATHS SPECIALIST: LEADER
- MATHS SPECIALIST: PARTICIPANT HEI
- BLENDED LEARNING SPECIALIST
- WORKSHOP WITH ACADEMIC STAFF AT ALL INSTITUTIONS – 2018
- ANNUAL WORKSHOP (2018, 2019, 2020)
- CONFERENCE ATTENDANCE AND PRESENTATIONS (2018, 2019, 2020)
- MONITORING AND EVALUATION (2018, 2019, 2020)
- MID/END PROJECT PROGRESS REPORTS (2019, 2020)

WE HAVE AND NEED TO CONTINUE TO

- IDENTIFY HE INSTITUTIONS
- IDENTIFY CHAMPIONS WITHIN THE HEIS
- IDENTIFY MATHEMATICS DEPARTMENT CHAMPION IN HEIS
- IDENTIFY MATHEMATICS COURSE LEADER IN HEIS
- WORKSHOP WITH ACADEMIC STAFF AT ALL (FIVE) INSTITUTIONS – 2018
  - UNDERSTANDING THE DMISRS PROJECT AND GET BUY-IN
  - IDENTIFY 'AT RISK' MATHEMATICS COURSE(S)
  - PLAN THE REST OF THE PROJECT
- ANNUAL WORKSHOP (2018, 2019, 2020)
- ETHICS APPROVAL FORM

HIGH LEVEL OUTCOMES

- NBT AND NSC DIAGNOSTIC REPORTS
  - INDIVIDUAL WITH POINTERS TO BLENDED LEARNING MATERIALS
  - COHORTS WITH POINTERS TO HEI SPECIFIC BLENDED LEARNING MATERIALS
- 'AT RISK' COURSE(S) REPORT
  - DESCRIPTION & ASSESSMENT OF THE CURRICULA
  - DESCRIPTION OF SUPPORT STRUCTURES AT INDIVIDUAL HEI
  - DESCRIPTION OF COLLABORATIVE SUPPORT AVAILABLE
  - RECOMMENDATIONS
- PRESENTATIONS/PAPERS/CONFERENCE ATTENDANCE

TIMELINES


2018 Initial Workshop
2018 Workshop
2019 Workshop
2020 Workshop
M&E 2018
M&E 2019
M&E 2020
Mid Project Progress Report
End Project Progress Report

PLANS FOR 2019

- ACTIVITY2: PROJECT COORDINATION M&E 2019 [R72 844]
- ACTIVITY 3: PRINCIPLES FOR COLLABORATION DETERMINED IN CONSULTATION WITH PARTICIPATING INSTITUTIONS MOA [R145 688 – LEFT OVER FROM 2018]
- ACTIVITY 4: SURVEY OF AVAILABLE CURRICULUM-INTEGRATED SUPPORT FOR MATHEMATICS - STARTED BUT WILL BE SPREAD OUT TO 2019 [R72 844 – LEFT OVER FROM 2018]
- ACTIVITY 5: INSTITUTIONAL WORKSHOPS (5 PARTNER INSTITUTIONS SELECTED ON THE BASIS OF IMMEDIATE NEED): VUT (POSTPONED FROM 2018), UCT, MUT, RU, WSU? [R241 500 X 2]
- ACTIVITY 6: INSTITUTIONAL WORKSHOP PREPARATION: VUT (POSTPONED FROM 2018), UCT, MUT, RU, WSU? [R72 844]
- ACTIVITY 7: SHARING DATA RELATING TO ONE POTENTIALLY 'AT RISK' MATHEMATICS COURSE [R72 844 X 2]
- ACTIVITY 8, 9, 11 & 12: SYMPOSIUM 2019 [LEFTOVER FROM 2018 & R153 740 + R36 422]
- ACTIVITY 13: DEVELOPMENT OF BLENDED-LEARNING MATERIALS (MOA INSTITUTIONS) [R376 034 X 2]
- ACTIVITY 14: CONFERENCE PRESENTATIONS: REES. A-MODE, [LEFTOVER FROM 2018 & R115 735]
- ACTIVITY 16: MID / END PROJECT PROGRESS REPORT [R72 844]
- ACTIVITY 17: MONITORING OF CIS INITIATIVES AND THEIR EFFECTIVENESS M&E 2019 [R145 688 X 2]