**Problem Statement:** NBA Descriptive: Identification of courses (top / bottom n) based on CO attainment scores at the course level, considering common rubrics (C3.2.2 A).

**Problem Explained:**

The CO attainment scores are arrived at based on the performance of the students in various assessments. These include Internal Assessments, Assignments, Co-curricular Activities, Feedback and University Examinations. These assessments are categorized into Direct method and Indirect method, with each contributing a certain percentage towards the final attainment value. The various ways of assessment that constitute the Direct method and the Indirect method, in turn, contribute a specific percentage towards the attainment of that method. The methods of assessment and their contribution towards the final attainment value is configured at a branch level for an institution. The Course Objectives (CO) are mapped against appropriate Program Objectives and against Program Specific Objective (where applicable).

This problem statement strives to display the CO attainment scores for specific courses for the chosen academic year and term, while considering common rubrics.

**Selection Screen**

* Academic year
  + Mandatory/Optional: Mandatory
  + Default Value: Current academic year
  + List of Values: Yes
* Term: The multi-select values to be displayed will be based upon the type of user, as described below. Details of the terms applicable for an academic year are available in the collection *dhi\_term\_detail*.
  + Faculty: All the terms applicable per the entered academic year but only those during which the faculty had taken courses. Note that the faculty may not have taken courses during all the terms of an academic year.
  + HoD: All the terms that are applicable for the selected academic year.
  + Principal: All the terms that are applicable for the selected academic year.
* Department (Option available only to the Principal. For the other users – HoD and Faculty, it is limited to their respective Department only; for them, it should be defaulted which they cannot change.)
  + Mandatory/Optional: Optional
  + Default Value: Spaces
  + List of Values: Yes

**Detailed Procedure:**

The high-level selection criteria comprise of *Academic Year* and *Term*.

(As of 1st Jan, 2020, it is yet to be decided on whether to provide the CO attainment scores at individual student-level, and if so, the means to store that data. Till such time a decision is made, it is assumed that data will be calculated and stored only at a section-level. This specification document and the associated program code will have to be modified if data is calculated and stored at a student-level.)

* For the Faculty member, the CO attainment is displayed for the courses that the faculty has taken for sections of students based on the entered selection criteria.
* For the HoD, it will be similar information but for all the courses offered by that department based on the entered selection criteria.
* For the Principal, it will be similar to that displayed for an HoD, but the Principal gets to see this information for all the courses that are offered by all the departments of the institution based on the entered selection criteria.

While the scope of displaying information varies based on the user as detailed above, the process to access, collect and present the course related information remains the same for all users. This process is described for a “*Faculty*” user in the following paragraphs.

**Faculty Login**

1. Based on the entered selection criteria - academic year and term, from the collection *dhi\_lesson\_plan* get all the courses that the faculty member has taken. The *facultyGivenId* should be equal to the value of *employeeGivenId* from the collection *dhi\_user* for the faculty member. Note that the faculty could have taught courses for students studying in different semesters.
2. For each of the courses selected above, whether theory or lab, get the generic attainment configuration information from the collection *dhi\_generic\_attainment\_configuration.* Usually, the attainment configuration is set up at the individual Department level for specific academic years. However, occasionally some flexibility is provided where the faculty can alter the attainment configuration to better align with their individual method of teaching. If the value of *facultyCanAlter* is *true*, it implies that faculty members can alter the attainment configuration per their requirements; however, it is not necessary that each faculty member would do so.
3. While the framework for the generic attainment data is obtained from the collection *dhi\_generic\_attainment\_configuration*, the actual attainment values are obtained from the collection *dhi\_generic\_attainment\_data.* It is possible that data may not exist for every attainment configuration element that has been defined, due to, either such data being optional or just not available. It is OK for optional data to be not available; but any mandatory data that is missing should be highlighted at the time when results are displayed for this problem statement.

From the collection *dhi\_generic\_attainment\_configuration*, for the entered academic year and the default Department of the faculty, get the following department-level attainment configuration data for various types of courses – theory, lab, etc. as described below. Note that if *facultyCanAlter = true* and if the faculty has preferred to alter this department-level attainment configuration data, then it will be available under *courseWiseAttainmentConfiguration* for that specific course, else it will be available under *subGenericAttainmentConfigurationList*. The attainment configuration data, if provided by the faculty for specific courses, will always get preference over what has been provided at the department-level. However, the configuration data is presented in an identical manner in both these cases, with just the values being different.

Details of the attainment configuration information to be obtained are:

* Number of levels of rubrics
* Course type
* Various Direct Methods including their rubrics details
* Various Indirect Methods including their rubrics details
* First level weightage – proportion of Direct Methods and Indirect Methods in deciding the attainment level for the course
* Weightage of the Direct Methods
* Weightage of the Indirect Methods
* Identifying the mandatory Direct and Indirect Methods

For each of the courses obtained above and for the entered selection criteria, from the collection *dhi\_generic\_attainment\_data*, get the various COs’ attainments levels for the section at the course level. This data is to be obtained for the attainment configuration information that had been selected from *dhi\_generic\_attainment\_configuration* collection as listed above. Calculate the average value of the CO attainment level for each course – sum of the values of individual CO attainment level divided by the number of COs of that course. The presentation of this data is described further below in the section titled “*Presentation of Results*”.

(Note that the student-level data on CO attainment may be made available within the same collection or in a new collection, at a future date. If, and when that happens, if there is any need to show this student-level data, then the logic of this program and therefore the presentation of the results of this problem statement will have to be modified accordingly.)

**HoD Login**

The functionality when an HoD logs in remains the same as that of the Faculty. However, the HoD gets to see the same details but for all courses offered by the department based on the entered selection criteria. Additional ways to sort the data that is presented will be provided to the HoD, as explained further below in the section titled “*Presentation of Results*”.

**Principal Login**

The functionality when the Principal logs in remains the same as that of the HoD. However, the Principal gets to see the same details but for all courses offered by the institution across all departments for the entered selection criteria. Additional ways to sort the data that is presented will be provided to the Principal, as explained further below in the section titled “*Presentation of Results*”.

**Presentation of Results:**

1. Based on the entered selection criteria, all the COs of all the courses that get selected, are displayed on a bar graph. The COs of each course are clustered together along the X-axis, and the length of the bar along the Y-axis indicates the corresponding value of that CO of that course. The initial default order in which these CO details of the courses are displayed is based on a decreasing value of the average of all the COs of that course. Note that on this initial screen based on the entered selection criteria (*Academic Year* and *Term*), the faculty gets to see details of only his/her courses, the HoD gets to see the details of all the courses offered by the department, and the Principal gets to see the details of all the courses offered by the institution.
2. Hovering on any of the CO bars of a course presents the exact values of the attainment of all the COs of that course in a pop-up window. Clicking on any of the CO bars of a course will navigate the user to the next screen which is described below.
3. All the courses whose CO attainment scores have been selected based on the entered selection criteria will be listed in the left panel. These courses can be sorted in various ways based on the user, as described below.
   * Faculty:
     + Alphabetical order based on the course ID, or
     + The average value of all the COs attainment scores (total attainment) of each of the courses
   * HoD:
     + Alphabetical order based on the course ID, or
     + The average value of all the COs attainment scores (total attainment) of each of the courses,
     + The Faculty name
   * Principal:
     + Alphabetical order based on the course ID, or
     + The average value of all the COs attainment scores (total attainment) of each of the courses, or
     + The Faculty name

Note that “*Branch*” is among the initial selection criteria for the Principal.

The initial default sort criteria for all users will be the course ID. Among all the courses that get listed in the LHS panel, the course that was clicked-on in the previous screen should be selected and its details displayed in the central panel – as described further below. The user can click on any other course in the LHS panel to view its details in the central panel.

1. In the central panel, a bar graph is displayed with additional details of all of the COs of the selected course. Each CO is represented by 3 bars clustered, along the x-axis, with the length of each bar being a representation of the corresponding CO attainment values. These three bars are for *totalAttainment, directAttainment* and *indirectAttainment* score for the respective CO*.* Hovering on any of these clustered bars of a CO should display the corresponding three attainment values as measured along the y-axis.
2. On clicking on any of the clustered bars of a CO of a course, further details of its attainment will be displayed as described below:
   * Direct Attainment details:
     + Proportion of direct attainment (weightage) in calculating the total attainment of the CO (shown within brackets on the UX screens), and the actual value of this weightage
     + Individual methods that contribute to the direct attainment – the weightage of each such method (shown within brackets on the UX screens), its actual value, and its description. Clicking on the details button of each such method should then display additional details as described further below.
   * Indirect Attainment details:
     + Proportion of indirect attainment (weightage) in calculating the total attainment of the CO (shown within brackets on the UX screens), and the actual value of this weightage
     + Individual methods that contribute to the indirect attainment – the weightage of each such method (shown within brackets on the UX screens), its actual value, and its description. Clicking on the details button of each such method should then display additional details as described further below.
3. Direct attainment method: IA (Internal Assessment)

On clicking the details button of the direct attainment method “IA”, the following information should be displayed:

* Percent attainment value for IA
* Details of each specific instance of IA which includes the following. Note that there can be more than 1 of such instances of IA.
  + Question number
  + Total number of students
  + Number of students who participated (answered) that question
  + Number of students who attained the target attainment
  + Attainment value for that question (out of 3)
  + Attainment value for that question (out of 100)

1. Direct attainment method: UE (University Examination)

On clicking the details button of the direct attainment method “UE”, the following information should be displayed:

* Percent attainment value for UE
* Details of UE which includes the following.
  + Question number
  + Total number of students
  + Number of students who participated (answered) that question
  + Number of students who attained the target attainment
  + Attainment value for that question (out of 3)
  + Attainment value for that question (out of 100)

1. Direct attainment method: Other Assessment

On clicking the details button of the direct assessment method “Other Assessment”, the following information should be displayed. Note that “Other Assessment” includes assessments like *Assignments, Unit Tests,* etc.

* Percent attainment value for the assessment
* Details of each specific instance of such assessments which include the following.
  + Question number
  + Total number of students
  + Number of students who participated (answered) that question
  + Number of students who attained the target attainment
  + Attainment value for that question (out of 3)
  + Attainment value for that question (out of 100)

1. Indirect attainment method: Feedback

On clicking the details button of the indirect attainment method “Feedback” (or it can be any other such indirect attainment method), the following information should be displayed:

* Percent attainment value for that assessment
* Details of each specific instance of that assessment which includes the following.
  + Total number of students
  + Number of students who have given the feedback
  + % of students who have given feedback
  + Attainment value (out of 3)
  + Attainment value (out of 100)

1. Clicking on the “*Rubrics*” button will display the rubrics information related to all the attainment methods, both direct and indirect. The information to be displayed includes the following:
   * Method name
   * Method type (Direct / Indirect)
   * Target attainment
   * Rubrics levels (can be multiple)

The points “a” through “j” above describe how the data should be displayed when the user happens to be a faculty member.

When the user happens to be the HoD, the course list displayed on the left panel will have an additional sort criterion – based on “*Faculty name*”.

When the user happens to be the Principal, the functionality will be like that available to the HoD, except that the Principal gets to see data belonging to any of the department in the institution.

**List of attributes / Information needed to analyze the problem statement:**

dhi\_term\_details

* academicYear
* termStartDate
* termEndDate
* current

academicCalendar (can be more than one)

* termNumber
* termName
* scheme
* current
* year
* termStartDate
* termEndDate
* termType
* degreeId
* degreeBatch

dhi\_lesson\_plan

faculties

* facultyName
* facultyGivenId
* facultyDeptId
* academicYear

departments

* deptId
* deptName
* section
* termNumber
* termName
* degreeID
* courseCode
* courseName
* courseType
* termStartDate
* termEndDate

dhi\_user

* employeeGivenId
* designation

handlingDegreeAndDepartments

* degreeId

handlingDepartments

* + deptId
  + deptName
  + facultyName
* name
* lastName
* deptId
* deptName
* academicYear
* degreeId

dhi\_generaic\_attainment\_configuration

* academicYear
* degreeId
* deptId
* rubricLevels
* facultyCanAlter

subGenericAttainmentConfigurationList

* + courseType

directMethods

* + methodName
  + methodDescription
  + target

rubricDetail

* + - level
    - startFrom
    - extendsTo

indirectMethods

* + methodName
  + methodDescription
  + target

rubricDetail

* + - level
    - startFrom
    - extendsTo

firstLevelWeightage

* + directMethodWeightage
  + indirectMethodWeightage

directMethodsWeightage (can be more than one direct method)

methods (can be more than one)

* + weightage

thirdLevelWeighage (can be more than one)

* + methodName
  + weightage

indirectMethodsWeightage (can be more than one indirect method)

methods (can be more than one)

* + weightage

thirdLevelWeighage (can be more than one)

* + methodName
  + weightage

mandatoryDirectMethods (can be more than one direct method)

* + methodName
  + mandatory

mandatoryIndirectMethods (can be more than one indirect method)

* + methodName
  + mandatory

courseWiseAttainemtConfiguration (same structure as subGenericAttainmentConfigurationList)

dhi\_generaic\_attainment\_data

* year
* degreeId
* degreeBatch
* deptId
* termNumber
* section
* poStatus
* psoStatus
* academicYear

courseDetails

* courseCode
* courseName
* courseType
* courseDeptId
* scheme

faculties (can be more than one)

* + facultyId
  + facultyName
  + facultyGivenId

courseOutcomeDetailsForAttainment (can be more than one)

* + coNumber
  + coTitle
  + totalAttainment
  + directAttainment
  + indirectAttainment

directMethods (can be more than one)

* + - methodName
    - methodDescription
    - attainmentMethodCategory

nextLevelAttainments (can be more than one)

* + - * attainmentSerialNumber

questionLevelAttainment (can be more than one)

* + - * questionNumber
      * attainment
      * attainmentPercentage
      * numberOfStudentsParticipated
      * numberOfTargetAttainedStudents
      * rubricLevelAttainment (can be more than one)
      * guidelineLevel
      * startFrom
      * extendsTo
      * numberOfStudentsParticipated
      * numberOfTargetAttainedStudents
      * attainment
    - attainment
    - attainmentPercentage

indirectMethods (can be more than one)

* + - methodName
    - methodDescription
    - attainmentMethodCategory

nextLevelAttainments (can be more than one)

* + - * attainmentSerialNumber
      * attainment
      * attainmentPercentage
      * numberOfStudentsParticipated
      * numberOfTargetAttainedStudents

rubricLevelAttainment (can be more than one)

* + - * guidelineLevel
      * startFrom
      * extendsTo
      * numberOfStudentsParticipated
      * numberOfTargetAttainedStudents
      * attainment
      * attainment
    - attainmentPercentage

(Add other collections, documents and embedded objects that supplement the information that is provided by those listed above.)