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IDENTIFICATION OF CURRICULUM GAP AND INNOVATIVE ADD-ONS FOR POS ATTAINMENT IMPROVEMENT IN OBE MODEL

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Abstract:

Identifying the curriculum gap is a significant step in the processes of offering the Outcomes Based Education (OBE) to advance in the quality education. Programme Outcomes attainment indicate the Learning extent / performance of the OBE student under Knowledge, Skill and attitude components. It is highly required to put effort towards attainment of POs with high correlation target. At the same time it is dire need to take deep insight into the industry happenings to understand contemporary issues and address them innovatively with societal and industry concern. In this connection, curriculum gap identification is significant, leading to gap filling by offering value added courses/ add-ons adopting different teaching/learning methods innovatively. In addition, Curriculum gap analysis may lead to redesign of the curriculum which reduces the gap to a larger extent and hence enhances the PO attainment. On the other hand, there is always scope for curriculum gap identification, gap filling and to plan further improvement of PO attainment.

In this paper, the processes of identifying the curriculum gap is presented and further Value added Courses / add-ons suggested are innovative can enhances improvements in PO attainment.

Key words: Curriculum Gap, Outcomes based education, programme outcomes, innovative, Collaborative Teaching methods, Bloom's taxonomy

1.**Introduction:**

Curriculum can be seen as a framework to achieve certain goals and objectives in education arena. **Curriculum** is the comprehensive set of taught material in a school system. It is doctrinaire as opposed to the 'descriptive' **syllabus**, which is the outline of topics covered. The syllabus describes the means to achieve prescribed objectives of the system in the curriculum. If the **curriculum** prescribes the objectives of the system, the **syllabus** describes the means to achieve them. The term, 'curriculum' is derived from the Latin word "Currere" which means to run/to proceed. Currere refers to the 'course of deeds and experiences through which children grow to become mature adults. Curriculum without goals and objectives is like a unidirectional schooling with unnecessary spending of resources and at the end of the schooling/graduation student will not able to face the outside world.

Curriculum is the concern of several stakeholders such as University, teachers, students, parents and employers. Parents are eager to know the benefits of studying particular curriculum. University and teachers are concerned about what type of curriculum should we offer to learners? Students concern is to know what type of content is going to offer in classrooms [1][2][3].

It is very difficult to design the curriculum which offer expected knowledge, skill and behaviour which are in phase with industry. This challenge is due to constant changes happening in the industry. In other words, mere curriculum cannot make students industry

ready. Therefore, it is highly essential to identify the curriculum gap and cover the gaps so that student will be industry ready at the end of the programme. Curriculum designed has to be verified to know whether the end product will be as expected by the outside world. If the components /courses/topics required are not present and if they are essential to attain programme outcomes and required to be successful in the future profession, then such components/topics can be called as curriculum gap. If the programme is not autonomous, then teachers hardly feel the ownership of the curriculum. In such cases, University curriculum has to be taken as minimum expectation and add-ons are necessary. A course coordinator should not offer routine classroom lecturing; he has to adopt innovative and collaborative/cooperative learning methods which create interested learning groups.

As mentioned in [1], the enumeration of the definitions, thus, can be illustrated in algebra equations as follows.

1. Curricula as a set of *objectives = goals or objectives*
2. Curricula as *courses of study or content = content + goals*
3. Curricula as *plans = content + goals+ teaching methods*
4. Curricula as *documents = content + goals + methods + assessment*
5. Curricula as *experiences = content + goals + methods + assessment + extracurricular activities and learning environment + hidden curriculum + cultures*

Another challenge in the curriculum design is to have all elements to attain the programme outcomes. In this connection, if curriculum elements required to attain POs through COs are not present, then such elements are treated as a part of the curriculum gap. Elements of the curriculum gaps may also be added as additional topics in the given syllabus as a add on towards the attainment of POs. Course coordinator may decide this modification by discussing with Module Coordinator, Programme coordinator and Head of the department. May also be get approved in the dept. advisory board members consisting of Academic representatives (such as from IISc. ,IITs ,IIITBs, Regional engineering Institutions), concerned Industry representatives , Research labs, Alumni, Senior students, Senior professors of the programme. Every element either part of the curriculum or curriculum gap has to be offered to the students with goals, COs, targeted POs and teaching methods. It is necessary to align topic, goal/objectives, teaching and learning method and assessment methods. Curriculum design can be thought of an interactive open process. Since any given course has learning time bound, syllabus need to be covered in a given period of time (say 14 weeks in a semester) obviously there will be some gap. Purpose of gap analysis is to identify areas of improvement and completely gain the competency while attaining the POs with target set. The curriculum syllabi and content must ensure the concise and adequate coverage of knowledge, skill, problem solving and attitude under which POs are segregated as shown in the below:

Figure1. Segregation of MCA programme Outcomes into knowledge, skill and attitude group

In case of non-autonomous programme (For example, TIER-II) where university designs and decides, there may be large scope for gap identification. At large, curriculum gap identification can be done as shown in the Figure 2 and Figure3.

2. Processes of identifying the Gap

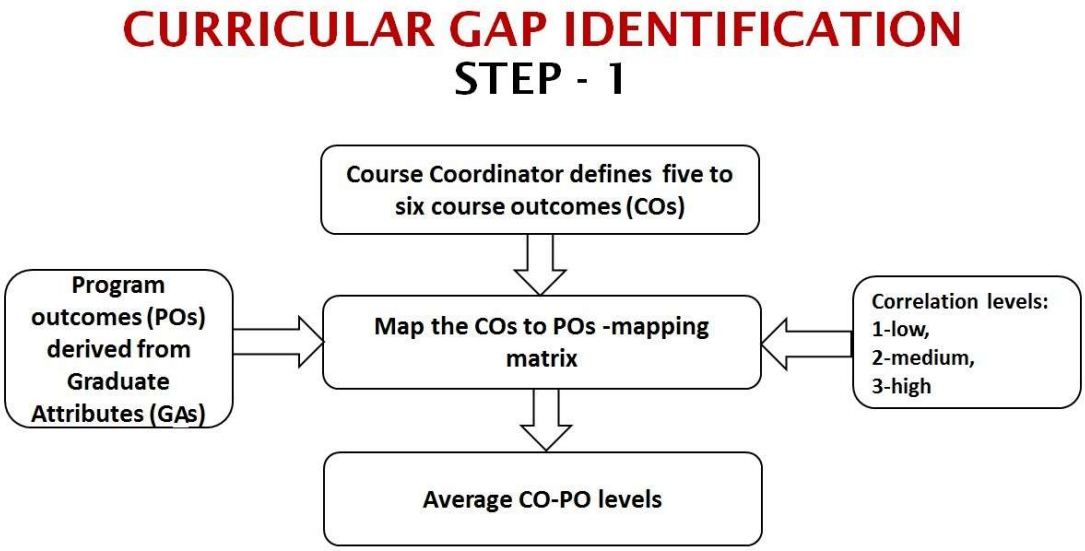

Figure 2 Step-1 of Curricular Gap Identification

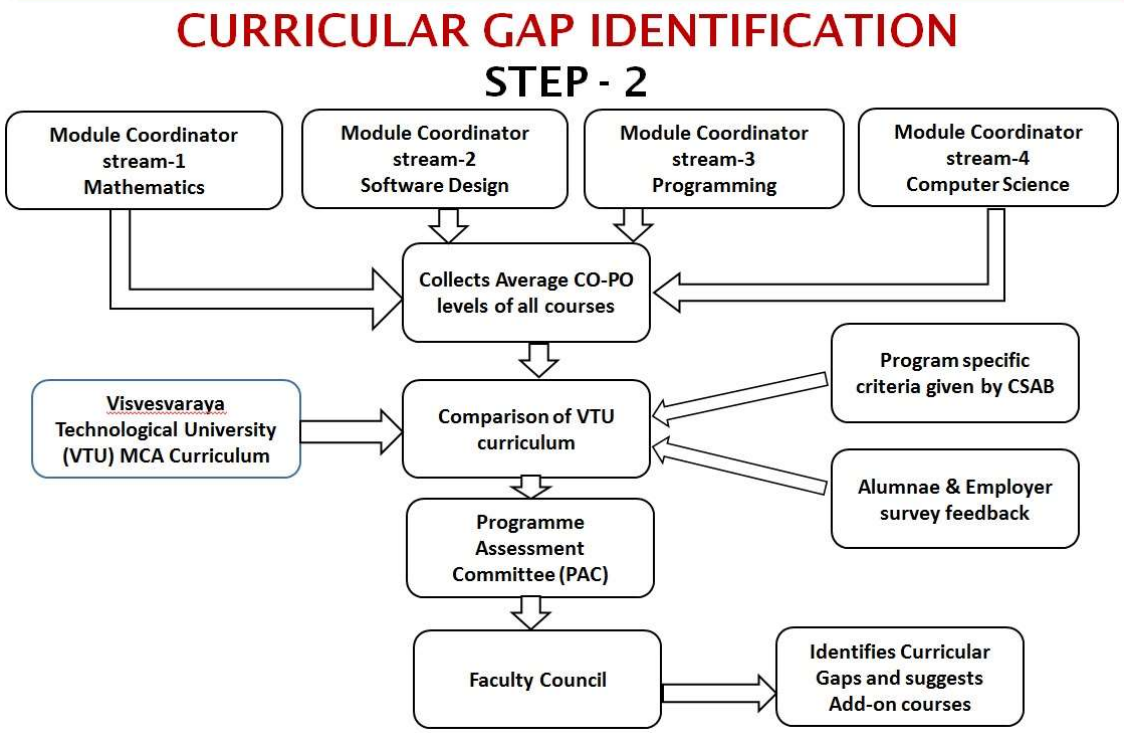

Figure 3 Step-2 of Curriculum Gap identification

3. Some definitions relevant to the study are:

Programme Outcomes (POs) – Programme Outcomes are narrower statements that describe what students are expected to know and be able to do upon graduation. These 12 POs relate to the skills, knowledge, and behaviour that students acquire in their matriculation through the programme.

Course Outcomes (COs) -- Course Outcomes are narrower statements that describe what students are expected to know, and be able to do at the end of each course. These relate to the skills, knowledge, and behaviour that students acquire in their matriculation through the course.

Table 1 Program outcomes derived from Graduate Attributes

Programme Outcomes	
PO1	**Knowledge:** Apply knowledge of computing fundamentals, computing specialization, mathematics and domain knowledge to provide IT solutions
PO2	**Analyse:** Identify, analyse and solve IT problems using fundamental principles of mathematics and computing sciences
PO3	**Design/Develop:** Design, Develop and evaluate software solutions to meet societal and environmental concerns
PO4	**Investigate:** Conduct investigations of complex problems using research based knowledge and methods to provide valid conclusions.
PO5	**Modern Tool :** Select and apply appropriate techniques and modern tools for complex computing activities

PO6	**Ethics:** Understand professional ethics, cyber regulations and responsibilities
PO7	**Life Long Learning:** Involve in life-long learning for continual development as an IT professional.
PO8	**Project Management and Finance:** Apply and demonstrate computing and management principles to manage projects in multidisciplinary environments by involving in different roles
PO9	**Communication Efficacy:** Comprehend & write effective reports and make quality presentations.
PO10	**Societal and Environment Concern (SEC):** Understand the impact of IT solutions on socio-environmental issues
PO11	**Individual and Team Work:** Work collaboratively as a member or leader in multidisciplinary teams.
PO12	**Innovation and Entrepreneurship (IE):** Identify potential business opportunities and innovate to create value for the society and seize that opportunity

A Syllabus of the programme cannot cover everything that you wanted to offer to your students. If programmes are autonomous, you can design your own syllabus whereas in a Tier-II programme that is when programme syllabus is designed by the University, it is highly essential to identify the curriculum gap and offers several challenges in the processes of bridging the gap.

At BMSIT&M, dept. of MCA has identified the curriculum gap and trying to address the same to move towards the attainment of Programme Outcomes(POs). The activities planned to cover curriculum gap can also fulfil to certain extent the expectation of the industry.

Table-2. Teaching/Learning methods that can be adopted innovatively for PO improvement

Recommended/Suggested Approaches for Improvement of PO Attainment	
Flipped Class: Apply, Analyse, Design/Develop, Life long Learning and Communication **POs: 1, 2, 3, 7 and 9**	**Poster presentation:** Apply, Analyse, Design/Develop, Communication and Individual & Teamwork **POs: 1, 2, 3, 9 and 11**
Blended learning (PDC): Apply, Analyse and Design/Develop **POs: 1, 2 and 3**	**Mini Projects:** Apply, Analyse, Design/Develop, Investigation, Modern tool, Ethics and Communication **POs: 1, 2, 3, 4, 5, 6 and 9**
Industrial interaction / visits: Design/Develop, Modern tool, Life long Learning, SEC and IE **POs: 3, 5, 7, 10 and 12**	**Case study:** Apply, Analyse, Design/Develop, Life long Learning, Communication and SEC **POs: 1, 2, 3, 7, 9 and 10**
PBL: Apply, Analyse, Design/Develop, Investigation, Modern tool, Ethics, Life long Learning, Communication, Individual & Teamwork and IE **POs: 1, 2, 3, 4, 5, 6, 7, 9, 11 and 12**	**Design Contest:** Apply, Analyse, Design/Develop and Modern tool **POs: 1, 2, 3, and 5**
MCQs: Apply, Analyse and Design/Develop **POs: 1, 2 and 3**	**Project Exhibition:** Modern tool, Ethics, Communication, SEC and Individual & Teamwork **POs: 5, 6, 9, 10 and 11**
Think pair share: Apply, Analyse, Design/Develop and Individual & Teamwork **POs: 1, 2, 3 and 11**	**Student paper publications:** Apply, Analyse, Design/Develop, Modern tool, Ethics, Life long Learning, Communication, SEC, Individual & Teamwork and IE **POs: 1, 2, 3, 5, 6, 7, 9, 10, 11 and 12**

Table-3. Teaching/Learning methods that can be adopted innovatively for PO improvement

Recommended/Suggested Approaches for Improvement of PO Attainment	
Seminar: Ethics, Life long Learning, Communication, SEC and IE **POs: 6, 7, 9, 10 and 12**	**Workshop:** Apply, Analysis, Design/Develop, Modern tool, Ethics, Life long Learning, Individual & Teamwork and IE **POs: 1, 2, 3, 5, 6, 7, 11 and 12**
Expert Talk: Ethics, Life long Learning, PMF, communication, SEC and IE **POs: 6, 7, 8, 9, 10 and 12**	**Project Work:** Apply, Analysis, Design/Develop, Investigation, Modern tool, Ethics, Life long Learning, PMF, Communication, SEC, Individual & Teamwork and IE **POs: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12**
Online Courses: Apply, Analysis, Design/Develop, Ethics, Life long Learning and Communication **POs: 1, 2, 3, 6, 7 and 9**	

4. Value Added Courses for PO attainment improvements

Following methods of teaching/learning method can be offered in the form of Courses which are generally thought as events by setting learning outcomes and mapping them to POs, identifying delivery mode/method and assessing them using appropriate tools.

Events/Courses can be organized/offered to fulfil the gap are:

1. **Expert Talks**: Invite experts from the industry to deliver sessions on topic addressing the POs such as , i) Project management and finance, ii)Societal and Environmental Concern and iii) Innovation and Entrepreneurship. These Invited expert Talk from the industry cover contemporary issues even catering the needs of industry requirements and ignite curiosity in the students to learn that technologies to be at par with industry expectations by the time they graduate.

The topic of the expert talk is decided by keeping the uncovered topics of the VTU syllabus in mind and making deliberation on the relevance of the topic and POs it addresses. The committee members of expert talk incudes, Head of the Department (HOD),Programme coordinator, Expert form industry and Faculty coordinator in decision making. To know the impact of the activity, along with regular feedback of the participants, online quiz can be conducted/assignments may be given which serves as Assessment Tools. Suitable questions can be set which helps in evaluating the students' performance and attainment of COs/POs. Expert Talk can be treated as a Course, defining objectives and outcomes, hence it can have COs mapping to POs, use appropriate tool to assess the students' performance, measure PO attainment through COs attainment .

2. Online Courses: Suggest and motivate students to take appropriate online certification programs like NPTEL/ MOOCs to keep the students updated with the drastic changes in technology and gain in depth knowledge which enables the students to acquire different skills of Bloom's cognitive levels such as Applying and Analysing [4]. The online courses can be offered to the students as optional assignments. Course coordinator can make decision such as exempting the students from routine ordinary writing assignment for the students who successfully completes with certificate. And an optimal weightage can be given in the Internal Assessment . Depending on the objectives of the Course/ content delivered and Blooms cognitive level of the assignment, it can be mapped to POs. **Online**

courses/examinations should be taken by every OBE teacher/student to be in phase with updating.

3. Adding Modules/ Topics: Curriculum gap at the course level should be identified and extra modules/additional topics may be introduced, new CO can be defined for that module/topic and can be mapped to POs which can't be attained through the prescribed curriculum. Since no University restricts us from doing additional activities which are useful in building the student career, University syllabus can be thought of as a minimum target. Additional Modules/topics may be decided by the course coordinator in consultation with module coordinator, Programme coordinator, HOD and based on the feedback of Alumni and Employer/ industry during interaction. Further, course coordinator can get it approved in the meeting of Board of studies/ department advisor board(DAB). DAB consists of representatives from Academia such as professor from IIITB, IISc , industry, research institute/ R&D in industry, Alumni and parents.

4. Partial Delivery of Courses from Adjunct Faculty : Certain advance topics in the selected course which has very high relevance /application in industry are identified . Such topics which are part of the syllabus can be delivered by the adjunct faculty who handled/ handling related projects in industry. Such expert motivates students to learn the courses and bring in the confidence towards competency enhancement. The PDC syllabus delivered by industry experts can be divided in the ratio of 20:80 in which 20% is within the syllabus and 80% should be beyond the syllabus which is extension of the topic identified. In PDC sessions course coordinator participates and learn interested topics, jointly evaluates assignments and mentor the projects given by the Adjunct faculty. This course can also be mapped to certain POs. Students performance will be evaluated from the industry perspective and should be evaluated to make the impact analysis for PO attainment.

5. Acquiring Skills: New skills required and to be acquired by the students for the industry readiness/ internships should be provided through conducting workshops with hands-on-sessions in the new technologies of high demand.

6. **Value added courses (VAC): It** may be offered by faculty members for subjects that doesn't have lab in the syllabus, for example. VAC lab facilitates to practically learn the new technologies/ modern tools. A lesson plan may be designed for the VAC with COs/POs. Students performance may be continuously evaluated. Another example, when professional and communication Ethics course was removed for 2013-16 syllabus, Towards attainment of the PO, professional Ethics , VAC is offered.

7. Industrial Lab: Establish industry attached labs to make the students work on industry problems and understand the applicability of their theoretical knowledge in the context of business applications. By having a MOU with related company, a close interaction may help the course coordinator to orient the delivery content from the industry perspective.

8. **Train the trainer program: I**n association with the software companies to make the faculty members competent in teaching the new technologies/contemporary tools which may not be in the curriculum. However, Technologies / tools are required to carry out the industry projects.

9. Focused Seminar Series (FSS): To improve the knowledge on the topics beyond the syllabus including contemporary issues, every student is encouraged to accesses various resources, organize information collected logically in a sequence, prepare the seminar report

and make power point presentation and present it to seminar coordinators/evaluators. Based on the Rubrics defined, Seminar presented by the Individual students can be evaluated. FSS can be mapped to POs through COs.

Students seminar topic can fall under the themes of professional Ethics, project Management and Finance, Societal and Environment concern. By treating Seminar as a course, COs can be defined, for example:

CO1: Write logically organized report and give oral presentations related to the topic selected

CO2: Develop confidence for self- education and life-long learning

CO3: Acknowledge the sources of information accessed for developing the seminar report to maintain academic integrity.

FSS encourages self- learning, brings ability to adapt to life- long learning and enhances communication skill and understand professional ethics. Students seminar topic can fall under the themes of Ethics, project Management.

10. Open ended problems. To bring the ability to solve IT problems, open ended problems may be offered in the Course which maps to POs such as Innovation and Entrepreneurships and strengthens skills such as apply, analyse , design and investigate complex problems. These open ended problems can be offered as part of the Lab courses, Mini-project courses and Value added Courses (VACs). The dept. of MCA, BMSIT&M has offered the following VACs

Conclusion : Curriculum gap identification may lead to curriculum redesign. Since it is very difficult or almost impossible to stuff everything required to attain POs. Other curricular co-curricular and extra-curricular activities can be helpful to fill the gap and thereby move towards improvement in attainment of POs.

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