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# What does 'student-centered' mean and how can it be implemented? A systematic perspective

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Student-centered education is in the air. It is present in many reform agendas for higher education across every discipline and is shortlisted as an important goal for teaching and learning in many reports and recommendations of professional agencies and scientific societies (for example [1,2]). There is wide consensus that moving from teacher centered to learner-centered courses, classroom designs and assessment programs is the best way forward for Biochemistry and Molecular Biology Education. The move is particularly essential in Biochemistry and Molecular Biology (BMB) introductory courses, if one considers for example that in the USA "Lecture format is emphasized in at least 80% of classes at all levels." [3]. Defining what characterizes a student-centered BMB course is therefore necessary and urgent. In other words, which criteria must be satisfied and what is the corresponding evidence that is required to attest that a BMB course is student-centered? Unfortunately, there are no categorical answers to this question.

Recognizing that a certain class or course is absolutely teacher-centered or traditional is relatively straightforward. All BMB faculty have lived through this experience and it is clearly described in papers, books, blogs and illustrated by internet videos. It means sitting and listening through a lot of "why is this relevant or interesting to me?" sort of lectures and attending cookbook labs. Classifying any given course as student centered is less straightforward. For example, if approximately 25% of class time of a BMB course uses some faculty/student interactivity to tackle a relevant real world issue, is that course automatically student centered? It is fair enough to acknowledge that the course is not purely traditional any longer, but is adding short time intervals of active learning exercises all that there is to it? If not, what is missing, what further changes are required and what elements are necessary to support that a course is student centered?

The concept of student centeredness needs to be operationalized so that faculty can better use it. Student centeredness is easier to understand than to define. It is ultimately the consequence of certain ways of teaching – for example, teaching that "focuses" on student learning, or that puts "students at the center" of the educational process, or that makes students "active and responsible learners". The definition of such ways of teaching - Learner-centered, learning-centered teaching or student-centered learning  - are imprecise. From a

more pragmatic point of view, finding an operational definition looks just as problematic. Indeed student centeredness is multidimensional, as it relates to course design and implementation, selection of relevant curriculum suited to the likely class needs, organization of course materials and delivery of classes complying to current knowledge about adult learning, assessments that steer learning and achieving a sustainable motivation and engagement of students. The two resources discussed below are very useful for those who wish to reflect, analyze and research the level of student centeredness in BAMBED.

The Book "Learner-Centered Teaching: Five Key Changes to Practice" [4] is a large step forward in operationalizing a definition for student centeredness. The five key characteristics are (a) the balance of power: faculty do not make all the choices about the course and may involve students in deciding which examples might be used in class or which criteria will be applied to measure a certain proficiency; (b) the function of content, which expands to include the development of student metacognition, such as self-awareness; (c) the role of the teacher, who becomes less a transmitter of knowledge and more a facilitator of learning; (d) the responsibility for learning, which is more handed to the students, who can no longer just come to class and listen but must be prepared to bring questions, contribute to class activities and manage group work; (e) the purpose and processes of evaluation, which shifts from marking students a couple of times per semester to providing constructive feedback and to assisting with overcoming individual difficulties. These 5 principles are very useful. Coming back to the above example on the introduction of active learning exercises, if it is implemented properly, it could address terms b) , c) and d) but says nothing about a) and e). However, active exercises may be targeted at high or low level of cognition, may focus on students conceptual difficulties or not and may be connected to students interests or not. Having a more systematic description of the components of each of the five principles would be very handy.

A paper by Blumberg and Pontiggia [5] is a relevant addition to this story. Under a benchmarking perspective, the paper lists objective elements that might be collected to attest learner –centeredness of a course, educational program or institution.  The elements compose a useful and comprehensive checklist. The authors offer 29 components under Weimer's 5 principles and I paraphrase below one principle for each dimension. For example, one condition to balance power is focusing less on class attendance and more on providing flexible opportunities for learning. Under the function of content is also " to help students evaluate why they need to learn content, acquire discipline-specific learning methodologies, practice using inquiry or ways of thinking in the discipline, and learn to solve real world problems". As to the role of the instructor it also includes ensuring that learning objectives that are

measurable and attainable by students are articulated and aligned with classes and assessments. The course should make students responsible for developing skills related to reading and developing research. Assessment tools should include peer and self assessment and should enhance students ability to learn from mistakes.

A clarification of what it means to teach in student centered ways can aid BMB faculty in developing a more precise and comprehensive self-awareness regarding their teaching and in identifying opportunities for further improvement. A more systematized description of the concept is also important for those who wish to define and prioritize changes. The two suggested resources are interesting learning tools for BMB faculty. Students will certainly appreciate it.

References

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