A heuristic for curriculum change in engineering education

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	Variable	Description	Key references
A	**Context**		
1	Attributes of faculty and course programme	1. Short description of the programme of the content, including learning objectives and key numbers concerning graduation rates, duration, percentage of switchers, negative recommendations on continuation of study (BSA), female/male students.	[1, 2]
2	Faculty culture regarding education	1. Attitude and beliefs of management and teachers regarding the course learning goals and final objectives. 2. Attitude of management and teachers regarding education in general. 3. What is the proportion of time spent on research and education?	[3, 4]
B	**To what extent have the changes regarding the curriculum been implemented effectively?**		
4	Necessity of changes	1. What is the reason for these changes? Is there external and/or internal pressure? 2. Most important issues/ problems regarding the programme. 3. Problems experienced by students, management, teachers and other actors such as Department of Education, alumni, employers of graduates. 4. Who is the problem-owner?	[1, 5]
5	Goals of the innovation	1. Is there a new vision formulated? 2. Which goals are formulated: regarding the curriculum, the organisation of the curriculum and the faculty as a whole. 3. Is there a prioritization of these goals? 4. To what extent are these goals specific to engineering? 5. What are the educational foundations underneath the goals. 6. Are these goals part of a shared vision? 7. What are the projected results? What are 'must haves' and 'wish to haves'. 8. Is there is final date for when the goals need to be achieved.	[1, 5, 6]
6	Preparation	1. Which sources/documents are consulted? Literature, reports, individual accounts, etc. 2. Which documents are drawn up in the preparation process? 3. What role do these documents plan in the planning phase and when? 4. Is there anything left unchanged in the programme? Which part is this and why? 5. Who are involved in the preparations? Why are these persons selected and what roles did they take on? 6. How and how often do the teams communicate with the other and with the wider community? 7. Is there any kind of resistance towards the change in the organisation? Where in the organisation does it occur and how are these dealt with? 8. How many resources are available for those involved in terms of time? 9. How is the impact of the change evaluated and monitored? 10. What role is given to the quality control officer/unit in the evaluation and monitoring activities?	[5, 7]
7	Implementation	1. What implementation strategy is chosen? How does this strategy tie into the strategies identified by e.g. Borrego & Henderson: curriculum & pedagogy, reflective teachers, policy, shared vision or a combination of these? 2. Who are involved in the preparations? Why are these persons selected and what roles do they take on? 3. What are the catalysers and barriers in the process of implementation? Who or what are these and when do they occur? 4. How and how often do the teams communicate with the other and with the wider community? 5. Is there any kind of resistance towards the change in the organisation? Where in the organisation does it occur and how are these dealt with? 6. How many resources are available for those involved in terms of time? 7. When are the supporting officers (rostering, etc.) involved in the process? 8. Are there any guidelines for the developers and for professionalising teachers?	[5, 8, 9]

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		9. Is there monitoring in place and if yes, what was monitored by who? 10. What role do quality control play in the implementation of the change? 11. How do those involved preserve momentum for the change and process?	
8	After implementation	1. Is the status quo of the change satisfactory to those involved in the change? 2. What data is currently monitored and why? 3. How do those involved keep the organisation's focus on the change? Is it enough? 4. How is dealt with unforeseen issues that are the consequence of the change? 5. What is still left undone? What does still need to be improved? 6. How is sustainability taken care of?	[5]
C	Have the changes in the curriculum been effective in terms of attributing to achieve the course's final terms?		
9	Description of the curriculum change	1. What are the exact changes that were designed and implemented and what are the rationale and considerations underlying these changes? Is the change evidence-based? 2. Is a vision formulated? What was this vision and who formulated it? 3. Are new learning objectives developed in terms of knowledge, preparation for society, personal development and competences? 4. Is there a clear alignment between the new learning objectives and the change itself? 5. To what extent are courses integrated? What is the position of the arts and social sciences in the new curriculum? 6. Do the changes reflect the ideas on the engineer that is an expert in his own discipline and knows how to connect it with other disciplines?	[7, 10]
10	Student engagement/ satisfaction with the curriculum	1. What teaching and learning activities are included in the curriculum and to what extent are these activities intended to activate for the students? 2. To what extent are student-centred learning and assessment activities viewed as an integral part of student support? 3. To what extent are student-centred teaching and learning activities viewed as an integral part of student retention policy and aimed at helping students to find their feet in the programme? 4. To what extent does the institution organise and facilitate capacity, understanding, skills and opportunities for all students to be engaged and successful? 5. Do students feel at home in the programme and at the faculty? 6. How are students supported to optimise their success? 7. How does the programme deal with resit exams, retake assignments and study delays? 8. How does the programme challenge students to develop good study habits and attitude? Is there coaching available for students?	[11, 12]
11	Do-ability*	1. To what extent is the programme aimed at do-ability*? 2. How is the course load spread out over the semesters? 3. How and how often are students assessed? 4. How is programme do-ability and student engagement monitored? What data is collected? 5. How many credits on average do the students obtain per semester and in the first year? 6. How many students leave the programme and when? 7. What is known about how students spend their time? How much time do they devote to their studies? 8. How are grades distributed in each course and how does that compare to the old programme?	[13, 14]
*Do-ability pertains to the absence of barriers in the programme, but also about the extent to which students are challenged to make decisions that affect their success positively.			

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