

Curriculum: A Proposed Definitional Framework

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Introduction

The curriculum is one of the most important artifacts an institution creates ¹. It has the power to both determine and to drive educational outcomes and “there can hardly be a more significant concept than ‘curriculum’ with which to understand higher education” ^{2,p.6}. It is, however, one of the least studied. One of the most notable results of a “review of the literature on curriculum in higher education in the UK, the USA and Australia ... is the dearth of writing on the subject” ³.

Higher education is in the middle of rapid and disruptive change. To remain relevant, not only should our curricula be designed to meet the needs of students, industry, employers, and society but they should be “flexible and adaptive in a dynamic environment where change is a constant” ⁴. Furthermore, innovations must be grounded in sound pedagogical practice and confirmed learning theories and once implemented, assessed to ensure they meet projected objectives ⁵. It is our intention that with this paper we will make a contribution to these theoretical underpinnings.

Many academics^a enter the academy unprepared for their role as educators ⁶, may lack formal education about teaching and learning ^{7,8} and read little regarding education, with many unaware such literature even exists ⁹. Many are unfamiliar with the concept of curriculum ¹⁰ and its relationship with student outcomes ^{8,11,12} and despite a growing requirement over the past 10-15 years for initial teacher training of university academics ^{8,13} there is little evidence such training is making a difference ^{13,14}.

We present a work-in-progress report on our work to develop a commonly understood and accepted definitional framework for curriculum that could provide heuristic support to academics as they design, develop, implement and maintain quality curricula that deliver the desired educational outcomes and respond to the dynamic environment in which they operate. The proposed framework emerged from a synthesis of the findings from a study of how engineering, software engineering, computer science, and information systems academics at three Australian universities understood and conceived of curriculum, how they used it and the implications that flowed from those conceptions and behavior. The focus of this paper is the theoretical concepts of curriculum. It does not consider decision-making related to determining appropriate goals, content, and learning outcomes, nor the operationalization of a curriculum, that is its design, development, delivery, and evaluation. Neither does it consider the pedagogy associated with implementing a curriculum including teaching and learning, and assessment activities. These worthwhile goals fell outside the brief of this research.

The paper begins with a brief summary of the literature that discusses curriculum, followed by the methodology underpinning the research, and a discussion of the findings which led to the emergence of the proposed definitional framework. We conclude with a brief

^a A member of staff of a higher educational institution engaged in teaching; sometimes also referred to as lecturer or professor; synonymous with faculty. An academic may be a permanent, on-going member of staff or one employed on a fixed term or sessional contract.

consideration of the on-going research required to complete development and validation of the proposed framework.

Curriculum – what is it?

There exists a considerable variety of meanings and different usages of the term curriculum and this variety and various uses has the effect of impeding communication and decision making^{12,15-17} on the subject. Compounding the confusion of understanding of the term curriculum, there is a confusion of language used to describe it and its component parts, or elements. Despite this broad confusion, authors frequently do not provide clarification of the meaning of the words they are using, leading to the situation where the literature of curricular design is not only confusing, it is positively ambiguous¹⁸.

Just how academics perceive the term curriculum and what is meant when they use it depends largely upon the context. A synthesis of the literature suggests curriculum can be described as comprising some or all of the following six aspects:

- *a concept* – how one thinks about a curriculum in the abstract or meta level – identifiable when one talks about **a** curriculum rather than **the** curriculum^{12,17};
- *an artifact* – a document or set of documents – in other words, the written, published, planned, intended curriculum^{12,19-22};
- *a body of knowledge* – content that is to be transmitted, delivered, taught^{16,17,22-25};
- *a process* – the life cycle of curriculum planning, design, development and delivery – as clearly identified by Lattuca and Stark¹⁶ and Wiles²⁶. Others^{12,17,19,21,27-32}, through the notion of plans and planning, suggest a process where process is seen as a systematic series of actions directed towards achieving a goal;
- *a product* – an attempt to achieve certain objectives through structure and organization – represented variously as a structured series of intended learning outcomes^{2,16,27,28,30,33}; and
- *a practice* (praxis, or pedagogy) – an approach to delivery (of content to achieve certain objectives)^{12,19,22,26}.

The literature is even less clear as to whether teaching practice, or pedagogy is included in or excluded from curriculum. Some authors remove teaching practice from their definition of curriculum. Barnett and Coate^{2,pp.5-6} do so explicitly, arguing that the “curriculum sets out the aims” while “pedagogy looks to realize those aims in the most efficacious way”. Others are less explicit but remove pedagogy nonetheless. For example, Skilbeck²¹ talks about “designs ... *and* the implementation of these” (my emphasis), and both Stenhouse²² and Prideaux²⁰ suggest that the curriculum is translated into practice. On the other hand, others specifically include pedagogy within their concepts of curriculum. For example, Glatthorn^{19,p.2} argues that “curriculum includes instruction”. He contends that the view “curriculum is what is taught and instruction is how it is taught” does not make sense because “such a separation ... divides two entities that are almost inseparable”. Many others, however, make no mention of pedagogy leaving it to the reader to determine for themselves whether pedagogy is a legitimate element of curriculum or not.

To overcome the issue of whether pedagogy is included in curriculum or is external to it, Zais^{17,p.12} proposed a continuum that bridges the divide between the curriculum and pedagogy. Zais’ continuum is based upon Taba’s premise that “distinctions need to be drawn between aspects of learning processes and activities that are of concern in curriculum development

and those that can be allocated to the realm of specific methods of teaching”³⁴. Zais^{17,p.12} suggests curriculum sits at one end of the continuum and is “ultimate-general” while instruction sits at the other end and is “immediate-specific” and describes the continuum as something “along which subjective judgments are made to determine the *curricular* or *instructional* nature of educational phenomena”^{17,p.12, original emphasis}. This aspect is discussed in greater detail in section (c) *Program and course curricula exist in a form of hierarchy* later in this paper.

Importantly, if any curriculum is to be “practically effective and productive”^{24,p.9} it must go beyond a simple statement of the content or knowledge and should provide “the overall rationale for any educational programme”^{24,p.9}. Inclusion of the rationale for the articulated curricular purpose within the definition ensures that those who were not involved in the development of a curriculum are provided with some insight into the original reasons driving the choice of goals and values.

Lattuca and Stark¹⁶ suggest that to improve communication and decision making related to curriculum, a widely understood and accepted “definitional framework” needs to be developed. They suggest that such a framework will facilitate “productive discussions and wise decisions ... [and] inform curricular revisions”^{16,pp.2-3}. As the higher education sector is characterized by great diversity of institutions, programs, and students, crucially, such a definitional framework must provide “a definition of curriculum that can be applied across these differences”^{16,p.4}. Importantly, a definition “does not mean that everyone must agree on the content to be studied, how it should be studied, or who should study it. It does not mean that everyone must agree on the specific skills or outcomes students must achieve”^{16,pp.3-4}.

We respond to this call and in this paper propose a possible definitional framework for curriculum.

Methodology

This paper presents a synthesis of the findings from a small, qualitative study involving 22 engineering, software engineering, computer science, and information systems academics from three Australian universities. Of the 22, six were women and seven possessed formal educational qualifications in addition to a Ph.D. in their research domain. Participants’ involvement with curriculum design and development at university level ranged from 6 months to more than 30 years.

Data were collected via six in-depth, semi-structured, one-to-one interviews, and five small focus group interviews. Interviews lasted between half and one hour, and focus groups were between one and one half and two hours long. Participants were asked to describe their concept of curriculum – focus group participants created a model of their concepts, using a white board, markers, and magnetic tags, which they then used to describe their conceptions and practices. Participants also described what they did when they were asked to teach a course that had not been taught at their institution previously; what they did when they inherited a course that someone else had taught before them; and what they did when teaching the same course over a period of years.

Data were analyzed following Charmaz³⁵ approach to grounded theory. Table 1 below summarizes the key themes and categories that emerged from the data analysis. This paper focuses on the themes of curricular concepts and participant behavior.

Table 1 – Key themes and categories which emerged from the data analysis

Themes	Categories
Curricular Concepts	Confusion of concepts and language Designed object Design process Implement Complexity / hierarchy
Participant Behavior	Focus at course ^b level Change Sourcing of content
Curriculum Drift	Program ^c moves out of balance Normal and expected

Discussion

Participants did not possess a common understanding of the elements from which a curriculum is composed, nor did they have a common language with which to describe it. There was a range of terms used to discuss and describe curriculum. For example, when talking about desired student outcomes relating to a program curriculum, participants used 12 distinct terms. These included “student objectives”, “learning outcomes”, “graduate attributes” and “generic skills”. Groups and individuals used more than one term each, with one group using five distinct terms. There was greater consistency of use of terms evident when discussing and describing outcomes related to individual courses. A total of five distinct terms were used and only one individual used two terms. The term “learning outcomes” was used by four individuals and two groups, while two groups used “course outcomes” and the fifth group and one individual used “outcomes”. The terms “student skills” and “learning objectives” were each used by a single individual.

Using fewer terms to identify and describe course outcomes and using them more consistently, suggests participants had greater familiarity with the design and development of courses as opposed to programs. Participants were also more comfortable talking about their courses and course outcomes rather than the program, again suggesting greater familiarity with the concept of courses having outcomes than they were with programs having outcomes. Familiarity with courses rather than program curricula was noted by Stark et al.³⁶. The literature that discusses curriculum in higher education also reflects this focus on courses¹, with an emphasis on course rather than program design and development^{25,37-40}.

The confusion caused by the lack of a common language exacerbated a confusion of understanding. Initially there was no apparent agreement on whether a curriculum belonged to a program, to a course or to both. Focus group participants did not question their different understandings; they simply discussed curriculum using the terms each believed appropriate only halting to seek clarification when it became clear that although they were using the same terms they actually meant different things. Within the focus groups, participants’ ability to

^b Course refers to a single unit of study, sometimes also called a unit, subject, or module. Students take a number of courses each semester and need to complete a set number of courses to meet the requirements to complete a program of study.

^c A complete, integrated course or program of study leading to the award of a degree qualification such as a Bachelor of Engineering, or a Master of Business Information Systems. A program is constructed from many courses.

create a model of their conceptions of curriculum was hampered by this lack of a common language and a common understanding of the elements from which it is composed.

Despite lacking a common understanding of curriculum, focus group participants clearly described curriculum as a design problem. They explained that “graduate” or “student outcomes” are the “guiding principles”; that the curriculum designer sets out to achieve. The “aims”, “learning outcomes” and “structure” constituted the ‘thing’ that was designed to achieve the specified goals, and the “content”, the “subject matter”, “topics”, “modules of content” were some of the material the designer had to work with to design the ‘thing’. They also explained that the “mode of teaching”, “teaching methods”, “learning activities”, and “assessment” were the means of “implementing” the ‘thing’. “Available resources” and “cost” were “determinants” or “constraints” on both the design and the implementation. Furthermore, “like all design problems”, the designer would “start with the goals” and then, “factoring in the constraints” such as human resources and costs, would proceed to design a solution that would be “used to guide” the “implementation”.

In identifying curriculum as a design problem, participants clearly described a “process around which we decide what’s in the curriculum”, and noted that this process includes another decision-making process to determine the “lower granularity of how you ... organize the curriculum”. Although only one focus group labelled the official-curriculum as a “designed object”, all participants’ descriptions and models identified the official-curriculum as a purposeful object that was the output of a design process. Furthermore, participants not only articulated the idea that curriculum encapsulated both the process and the output of that process but that both were necessary. These two components were described as closely interrelated “because you can’t really understand that [the official-curriculum] in absence of that [the process]. You can’t represent it [the official-curriculum] without that [the process]”. Descriptions and models produced exemplified the iterative process typical of engineering design^{41,42}. The academics’ process began with inception where the purpose, outcomes, and content were decided upon; there was clear separation of the design and the implementation of the curriculum; and there was evaluation of the curriculum to ensure that it was delivering its intended goals along with iteration forwards and backwards between these stages. The description, conversation, and model creation moved backwards and forwards between the various steps as participants moved from determining the elements of a curriculum towards the planning, design and implementation of a curriculum. Furthermore, participants described the official-curriculum as “a guideline, a specification of sorts, a framework”.

Participants also identified the need to clearly state and understand the goals and purpose of the curriculum and the constraints the curriculum will operate under because these determined both the desired outcomes and the ability to achieve those outcomes. Outcomes helped the curriculum meet the desired goals and purpose because “you get to the goals via the outcomes”; they are “the things we cover in order to meet those aims. We cover these things within the framework set out in the structure”. Additionally, it was important to identify and understand the constraints early, because if “you can’t achieve the goals it’s not much point in fantasizing about it”.

In likening the official-curriculum to a “specification of sorts” participants argued that teaching methods and approaches – pedagogy – were not part of the curriculum itself but were related to the “operationalization” of the official-curriculum. They argued, for example, that the same curriculum could be taught in two quite different modes, such as weekly or intensive, but since the objectives remained the same the only difference would be in the

teaching approach “because the face-to-face activities, compared to the off-line learning activities would have different relationships”. It was also suggested that even though they might be

redesigning a course ... keeping the objectives the same ... planning to use almost the same exams as I have previously as a marker point ... [but] changing the teaching method quite substantially ... I’m not changing the curriculum. I’m changing the approach or the method or the mode but not the curriculum.

They noted also that the process of operationalization produced a number of “variants of the official-curriculum”: the first of which is the “curriculum-in-use”. As the process of operationalization continued and the curriculum-in-use is implemented, that is it is taught, other variants of the official-curriculum were created, including the delivered-curriculum, the assessed-curriculum, and the hidden-curriculum.

Participants suggested that the elements of a curriculum apply equally to a program or a course, because curriculum can represent “a program and a group of subjects, and some majors”. One focus group even went so far as to suggest that it should be possible “to cut courses cookie cutter style” from the program curriculum. It was suggested that when undertaking curriculum design, the outcomes of a program “filter down” to the courses because the process of designing a curriculum is “a top down process”. Furthermore, participants suggested that because of the “top-down” structure of a curriculum with the different levels representing increasing granulation, that is, program, majors, minors, courses, lessons and so on, the curricula existed in a form of “hierarchy” such that “they’re almost the same thing, but at different levels”. They suggested that when developing a curriculum for a program “you come up with the degree program and then that becomes the individual degree courses”.

A synthesis of the findings which emerged from the data analysis has enabled us to propose a definitional framework for curriculum that is set out below.

Proposed curricular definitional framework

Our proposed curriculum definitional framework includes three principal and separate components: (a) a designed object – the *official-curriculum*, (b) a process of design from which the *official-curriculum*, that is the written curriculum, and *curriculum-in-use*, that is the implemented curriculum, are outputs, and (c) the notion that official curricula for a program and its constituent courses exist in a form of hierarchy and that the process of operationalization develops a set of curricular layers. Our proposed framework is as yet unverified and incomplete; not only does it require further research to understand the importance and nature of the relationships between the levels of curricula and the curricular layers, it requires verification and validation.

(a) Curriculum as a designed object – the official-curriculum

Our proposed definition of the *official-curriculum* consists of three key elements: curricular purpose, desired outcomes, and content.

Curricular *Purpose* is defined as the strategic goal the curriculum design sets out to achieve and includes the rationale behind that purpose. *Desired Outcome* is defined as the set of one

or more statements that describe the significant and essential knowledge that students will have and can reliably demonstrate on completion of the learning described in the curriculum. Together the set of statements captured by the curricular element *Desired Outcome* identify the knowledge, skills, and values that comprise the integrated learning experience expected of a graduate of the course or program and which reflect the articulated curricular *Purpose*. *Content* is defined as the set of one or more statements that provide a high-level description of the topics that are covered in delivering the *Desired Outcome*.

The relationship between the two elements of curricular *Purpose* and *Desired Outcome* requires that each individual statement that forms part of the set of statements captured by the curricular element *Desired Outcome*, is determined by and relates to the articulated curricular *Purpose*. Appropriate content is the product of the relationship between curricular *Purpose* and *Desired Outcome*. Importantly, although a large body of content may be suggested by the relationship between the curricular elements *Purpose* and *Desired Outcome*, only content that is used to help deliver the *Desired Outcomes* should be included.

Figure 1 presents an unambiguous pictorial model of these elements and the relationships between them. Rather than other less precise forms of modelling the Executable UML (^X/_T UML) modelling language was chosen because it was designed “to define the semantics of subject matters precisely”^{43,p.7} something which has been missing until now from descriptions and definitions of curriculum.

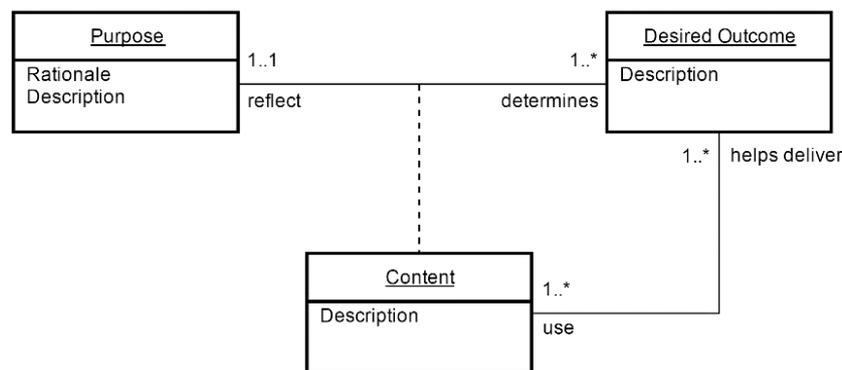


Figure 1 – ^X/_T UML Model of A Curriculum

Following the rules of the ^X/_T UML language, reading the pictorial model of curriculum described in Figure 1 we state that curricular *Purpose* always *determines* a set of one or more instances of *Desired Outcome* and that the relationship between curricular *Purpose* and one or more instances of *Desired Outcome* suggests *Content* for possible inclusion. The relationship between an individual instance of *Desired Outcome* and an instance of *Content* states that the curriculum only includes instances of *Content* which are used to deliver one or more instances of *Desired Outcome*. Reading the model in reverse we can state that each instance of *Content* included in the curriculum *helps deliver* one or more instances of *Desired Outcome*. The model also states that each instance of *Desired Outcome* is always related to the single instance curricular *Purpose* and that the relationship between those two curricular elements determines a set of instances of potentially suitable *Content*.

Using ^X/_T UML to capture our model of curriculum provides not only a pictorial model of curriculum, but also enables us to provide a very clear and workable definition of curriculum that could be used by academics to help understand what needs to be included when designing and developing a curriculum.

Using the model shown in Figure 1 above, we propose the following definition for curriculum:

A curriculum will always have a clearly articulated purpose or strategic goal that includes the rationale behind that purpose. Curricular purpose will always determine a set of one or more desired outcomes. A curriculum's content is the product of the relationship between the articulated purpose and associated desired outcomes. Inclusion of appropriate content is determined by its relationship with one or more of the specified desired learning outcomes.

It should be noted that specifically excluded from the proposed definition of curriculum is the notion of structure. The structure of semesters, semester length, number of courses and course size and weight required by an institution was identified by participants as one of the most significant constraints imposed on the design and implementation of a curriculum. During one of the focus group sessions, structure was identified as

a constraint that is so strong you almost don't think outside that box. You don't think I'd like to have 20 weeks on this. That is the right size [General agreement from other participants]. You think what is the coherent unit, coherent set of knowledge which fits in a 13 week chunk. And that's unfortunate, but we've been doing it for so long we've almost been straitjacketed and it's more than just a constraint. It's a box [quiet laughter and general agreement from other participants].

Our proposed definitional model of the official curriculum is applicable to a curriculum at any of the levels represented in Figure 3 and discussed in section (c) below.

(b) Curriculum as Process

As well as conceiving of curriculum as a designed object, and notwithstanding their confusion of understanding when describing their concepts of curriculum, participants clearly described a design process, such as might be used with engineering or software design that was associated with curriculum. This process is modelled in Figure 2 below.

Owing to the layers of process this model might be called the curriculum-as-process onion. The innermost layer – the official-curriculum or curriculum-as-artifact – is both the output of, and is used by each of the subsequent layers. The second and subsequent layers represent curriculum-as-process, the curricular process that both produces and uses the official-curriculum. The circular arrows represent the iterative and recursive nature of the process. Curriculum-as-process begins with ideation and the determination of need, represented by the second, purple layer. This layer of the process leads to the design of the official-curriculum, which is constrained by both the curricular purpose and constraints under which it is designed and must operate. The third layer – green, orange, and red – represents the “operationalization” of the official-curriculum. Operationalization involves using the official-curriculum as a guide to decision-making when designing, developing the teaching and learning and assessment material, and implementing the curriculum-in-use. The outermost layer – light blue – represents the process of curriculum evaluation where periodic reviews of the curriculum are conducted to ascertain how well the desired outcomes of the curriculum are met and to determine whether the specified desired outcomes are still appropriate and relevant. Participants described a process that was both recursive and iterative.

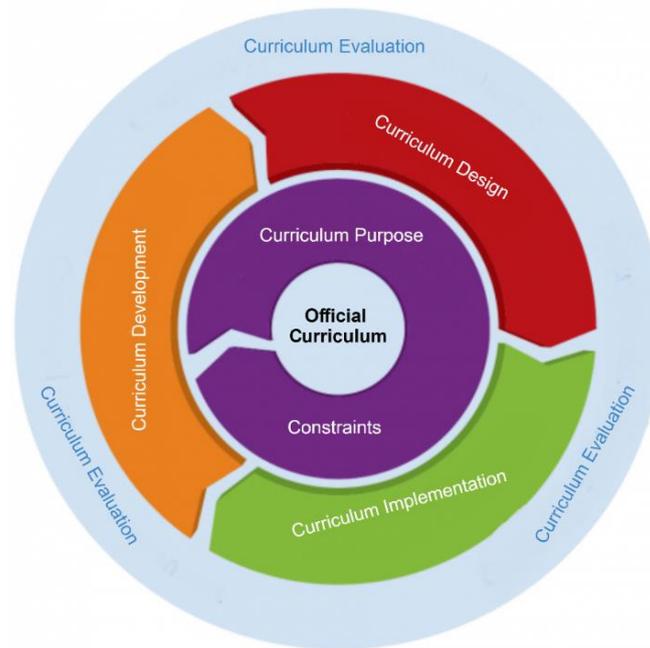


Figure 2 - The curriculum-as-process onion

Supporting the idea that the official-curriculum was a designed object and was the output of a design process, participants argued that its design and development was subject to a large set of constraints which with time would likely change both in importance and substance. They argued that “any design problem has constraints” and noted that, for example, “you don’t have infinite time; you don’t have infinite people to throw at it”. As noted above, the teaching structure imposed by an institution was identified as one of the most significant constraints on the design of a curriculum. Mandating that courses have a single, equal value and the imposition of a fixed teaching structure related to semesters, plays a big part in determining what was included and how it was implemented. According to participants, this meant “modularity becomes both the structure and the driving thing” and impacted equally upon program and course curricula. Participants noted that frequently this constraint became an aspect of the design leading to the content simply being “chunked” into the number of weeks’ teaching an institution imposed.

(c) Program and course curricula exist in a form of hierarchy

Participants noted that the official-curriculum for a program is decomposed into its component parts. Decomposition may be into whatever aggregation of sub-parts a particular institution uses, such as electives, majors, minors, specializations etc. According to participants, the decomposition of a program is important because when all the courses for a program are taken together they need to “add up to the whole”. This concept is modelled in Figure 3 below.

The research reported in this paper did not investigate the suggested relationships between the levels of curriculum. Investigation of these relationships, something which is needed to complete the definitional framework, is proposed as future research.

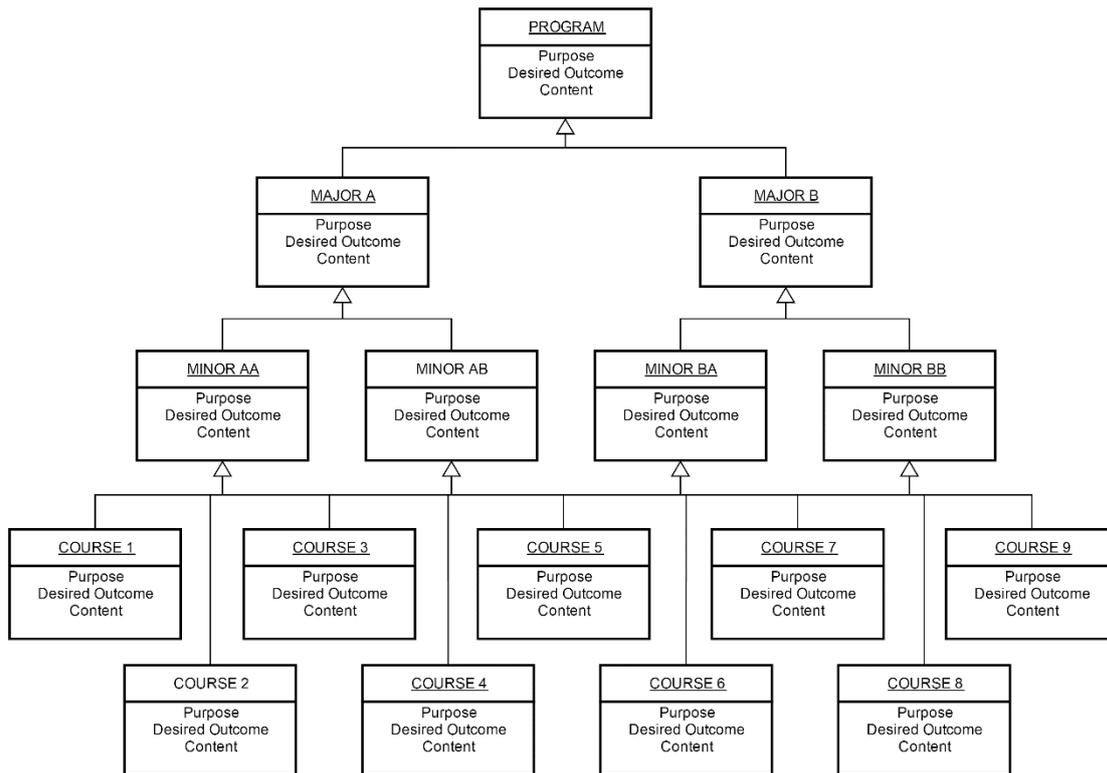


Figure 3 – Decomposition of a program curriculum showing the relationships between the different levels of the curricular hierarchy

The official-curriculum contains high-level details of what is taught and why, while the implementation of that curriculum, that is the curriculum-in-use, determines the detail of what is taught and importantly, how it is taught. Operationalization leads to the creation of artifacts related to the implementation of the curriculum-in-use, such as teaching and learning and assessment material. The creation of increasingly specific variants of the official-curriculum supports the notion of the concept of the curricular continuum as proposed by Zais^{17,p.12} and as represented in Figure 4.

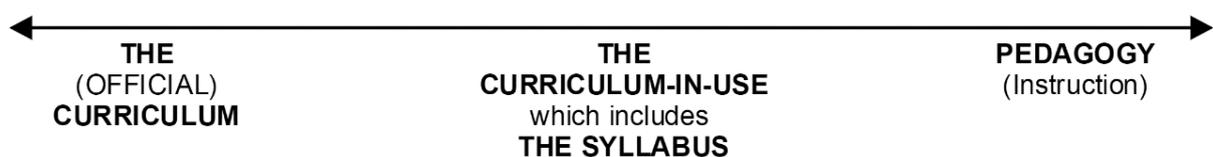


Figure 4 – Curricular continuum, based on Zais^{17,p.12}

As shown in Figure 4, the official-curriculum sits on the left of the continuum and is “ultimate-general”. The lifecycle process of curriculum-as-process moves the curriculum along the continuum to become ever more “immediate specific” leading to the development of the curriculum-in-use and finally to its implementation which in turn leads to the creation of layers of curriculum.

The curricular continuum as shown in Figure 4 permits the drawing of a hazy distinction between the activities related to curriculum and those related to pedagogy and instruction. It enables the argument to be made that within the curriculum document, that is within the official-curriculum the “prescribed content should be specific enough to provide a focal thrust for the teacher, but general enough to allow for specific content and materials to be selected

according to the teacher's personality and teaching style, and the students' needs and interests" ^{17,p.13}. This concept allows one to talk about **a** curriculum – the abstract notion of a curriculum, that is, a definition of curriculum – and **the** curriculum – the written, official-curriculum for a program or course – as well as the translation or implementation of the official-curriculum leading to the creation of the curriculum-in-use. The curricular continuum is what allows us to claim that the definition of curriculum presented in Figure 1 above is applicable to all curricula across all domains involved in higher education.

As modelled in Figure 1 above, the official-curriculum for a program sets out the purpose including the rationale for that purpose, the desired outcomes, and high-level descriptions of content. As modelled in Figure 4 above, both the desired outcomes and content included within the official-curriculum are sufficiently general that they do not constrain its implementation and the creation of the curriculum-in-use. Participants identified a variety of curricular layers created through the process of operationalization. As modelled above in Figure 4 above, the curriculum becomes ever more specific as the process of operationalization takes place. Participants suggested that operationalization leads to the development of curricular layers such as the official-curriculum, the curriculum-in-use, and even the "accidental-curriculum" – that is the one added to the official web-site by administrative mistake. The literature suggests other curricular layers such as – the delivered curriculum, the received curriculum, the assessed curriculum ⁴⁴, and so on.

Conclusions and future research

Participants identified curriculum as a designed object that was the product of the curricular process. It was composed of three elements: the purpose, the desired outcomes and the associated content. The specified curricular purpose, which includes the rationale behind that purpose, determined the desired outcomes. The relationship between the curricular purpose and the desired outcomes suggested content for inclusion. However, specific content was only included when it was used to help deliver a specified desired outcome. Structure was identified as one of the most significant constraints on curriculum and is specifically excluded from our definition of curriculum. Participants also identified curriculum as a design process, noting that neither the designed object nor the process could exist without the other. They further described the curricula for a program and its constituent courses as existing in a form of a hierarchy. The official- curriculum was seen as a general statement of what students should learn and why, while the curriculum-in-use (the operationalized official-curriculum) sets out specific descriptions of learning activities, assessment and pedagogy, sequence and so on.

We submit that the development of a definitional framework, such as the one proposed in this paper, may help academics to bridge the gap in their knowledge, especially if the framework is couched in general, rather than pedagogical terms. Furthermore, developing a visual implementation of such a definitional framework might provide even greater value. Not only would the definitional framework provide a common understanding of curriculum, but because of the brain's ability to "acquire more information through vision than through all of the other senses combined" ^{45,p.22}, a visual implementation may improve overall usability of our curricula. We suggest visualization will allow those working with curriculum to identify and understand the relationships between the various elements and so help understand where and what needs to be changed in order to meet changing needs. Visualization may help academics keep the big picture in mind and overcome the "piecemeal and incremental,

disjointed, ‘tinkering with parts’ approach” to maintaining and improving education systems noted by Banathy ^{46,p.8}.

Before our proposed framework could be adopted, however, further research is needed to understand the nature and importance of the relationships that exist between the different levels of the curricular hierarchy and between the curricular layers, as well as to validate and verify the complete definitional framework. Research into the development of a definitional framework and its implementation may suggest potential methods of visualizing the complex relationships between the elements of a curriculum.

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