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Curriculum Co-Creation:
Knowledge Co-Creation in an Educational Context

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ABSTRACT

One of the emerging areas is knowledge co-creation, and more specifically, in an educational context, curriculum co-creation. The ability to solicit feedback, reactions, suggestions, and improvements with regards to courses and educational programs from students is an interesting and promising one, but a concept which requires that existing norms and practices be put aside to allow students to share in the evaluation, revision, and design process, together with instructors and administrators. This paper examines the foundations of curriculum co-creation, including its educational theory foundations, critical variables and considerations, and a review of recent programs and initiatives. A framework of the key curriculum co-creation variables is presented, followed by suggestions for future research.

KEYWORDS

Course Development, Curriculum Co-Creation, Curriculum Development, Knowledge Management, Metacognition, Students as Partners

INTRODUCTION

To enable effective educational management, the process of planning and developing curriculums is important. Therefore, it is important to examine the impact and roles that emerging methods and processes can help to produce more creative and meaningful curriculums, and the means to obtain this result.

For many educators, the tried and true and established methods of designing courses and curriculums have been a bedrock of our education system. Much of the course and curriculum design work is done by the teachers and professors themselves, often in conjunction with peer colleagues and school administration. While feedback generally in the form of course evaluations are frequently solicited from students, they are largely focused on opinions gathered on a previous designed and completed educational "product" in the form of a course, seminar, or workshop.

With the increased attention given to the concept of "knowledge co-creation" where the inputs from various stakeholders are gathered with the goal of producing a better product, service, or educational offering, the role of students providing course and curriculum input has become an intense area of interest.

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Thus, the employment of a knowledge co-creation approach to curriculum and course design can help to expand and improve the role that stakeholders, especially students, can play in providing valuable information to educators and administrators. The purpose of this paper is three-fold: to explain what knowledge co-creation of curriculums is and what it can do; to examine the educational theories which address and are related to this area; and to review and categorize the factors impacting on the work being done in this area, followed by a framework from which to evaluate and then to propose fruitful avenues for further research. These are done in the context of reviewing and structuring the relevant research which has been done in this area.

What is Knowledge Co-Creation?

Knowledge co-creation is a concept that is derived from the marketing and management literature, with particular attention to the seminal paper defining this, which stated that consumers and other stakeholders want to interact with firms to "co-create" value (Prahalad, C. K., and Ramaswamy, 2000). Alternately, co-creation is defined by Kaminskiene et al. (2020) as being "a way of working together where people from all backgrounds are invited to jointly produce a product or service that will benefit all of them.

Knowledge co-creation can be defined as a process whereby critical stakeholders participate and play a role in the conceptualization, design, and other steps in the product development process. In its simplest form, this could be characterized by users of a product (a car, for example) being asked to provide inputs into the features and design of the car. In essence, this should result in a better product, since it seeks out and then incorporates the inputs of a wider range of stakeholders, many of which may have valuable insights since they are users or potential users of a product. In line with what the term suggests, "co-creation" means that there are multiple participants working together to create a product or service (Cook-Sather et al, 2014; Dunne and Zandstra, 2011)

This concept can be extended to a broad range of fields, including business, government and administration, and the management of social issues. In particular, there has been a sizable amount of attention given to the impact that knowledge co-creation can have on education. Certainly, since students are the "customers" who will be receiving their educational "product" through courses, seminars, and training, would it not be appropriate for them to provide input into the development of educational courses and programs? An alternate definition by Cook-Sather et al (2014) states that it can be described as a "collaborative, reciprocal process through which all participants have the opportunity to contribute equally, although not necessarily in the same ways, to curricular or pedagogical conceptualization, decision making, implementation, investigation, or analysis."

The concept could then be extended to university and institutional services, including school policies, student services and programs, and school/university facilities (Cook-Sather et al, 2014).

How Does Knowledge Co-Creation Fit into Education?

As mentioned in the previous section, education is an area which can benefit from knowledge co-creation, and this topic in general has received significant attention in terms of research in the education literature. While the entire realm can be broad, including facilities, services, policies, marketing/promotion, and also curriculum content, the latter has received the most attention, and is the focus of this paper. In short, how can knowledge co-creation fit into the process of creating educational courses and curriculums? What are the potential benefits, drawbacks and challenges, and what has been done in this area?

One important aspect of knowledge co-creation of curriculums is that it in some ways unconventional and a "new concept" for educators and administrators, many of whom are very accustomed to faculty and administration-centered approaches where they make all of the decisions and derive very little input from other stakeholders. Therefore, the issues of resistance, negotiation, and a lack of cooperation should be considered when considering this approach to evaluating or re-designing courses or a curriculum. In addition, it may be useful to consider the roles that the business

community, and legal and governmental aspects may impact upon the design of curriculums and courses. Also, it should be noted that the term "curriculum co-creation" can refer to a curriculum as a whole, or to a particular course or set of courses, or to the teaching approaches used in any of these.

Closely related to this is the concept of "students as partners" or some variation of this term. This concept has gained significant popularity, to the point of being formally specified as "Partners in Teaching and Learning in Higher Education," with the short form (Students as Partners) designated as SaP. This was defined as "a relationship in which all involved – students, academics, professional services staff, senior managers, students' unions, and so on – are actively engaged in and stand to gain from the process of learning and working together" (Healey et al, 2014). Regardless of the term used, and these are often used interchangeably, the employment of this approach is expected to result in students having a higher level of engagement, belonging, confidence, and a positive shift in identity. Both instructors and students have reported improved learning relationships and experiences, with the goal of improved courses, curriculums, and educational materials (Matthews et al, 2019).

However, as with any new concept, some educators, who otherwise may be very competent and committed to their fields, may find the approach of seeking direct inputs from or developing course content, delivery, projects, and evaluation, together with students, to be unfamiliar and uncomfortable. Those resistant may believe that they may not gather much useful information from students through co-creation. Also, there are students who may be reluctant or opposed to the idea, since they have the expectation that it would take up their time to engage in something which is "not their job." (Cook-Sather and Matthews, 2021). While the basic underlying principles of co-creation may not be that complex, there are a number of different factors, variables, and considerations which need to be taken into account when considering a move towards curriculum co-creation. As a result, it would be important to examine these so as to fully understand the concepts, theories, and methods supporting it, and the various issues which are important in the process. These are discussed in the upcoming sections.

Benefits of Curriculum Co-Creation

A place to start would be the traditional approach to teaching and curriculums, which can be termed the "conventional" model where the instructor, whether alone or with the inputs of other instructors and possibly administrators, decide how classes and courses are designed and structured, and what content is to be taught. Closely related to this is can be what is termed the "traditional" approach to teaching, which sometimes is referred to as the "sage on the stage." Basically, the main delivery method of this method is lecture, where the presentation and delivery of information from instructor to student is the primary focus (Laurillard, 2002).

Following these approaches, there is little or no student input, or feedback, from any other stakeholders in the educational process. Educators generally are thought to have the expertise, experience, and know-how to design the entire educational experiences for students, while students take on a passive role basically on the receiving end (Mann, 2008; Barnett and Coate, 2005; Giroux, 1981).

If an educational institution is only focused on using "conventional" curriculum and course designs and employing "traditional" teaching approaches, there is little need or desire to try out alternative approaches, and there may not be much need for knowledge co-creation. On the other hand, if the goal is improve courses and curriculums using innovative methods, then curriculum co-creation would be a worthwhile endeavor.

In general, the realm of curriculum co-creation can exhibit a wide range of characteristics, benefits, outcomes, and impacts. Key to this is the concept of partnerships between faculty/staff and students (Bovill, 2015; Bovill et al., 2016). Other outcomes include improvement in terms of more personalized learning (Zmuda et al, 2015) and the development of learning communities (Lubicz-Nawrocka, 2017). Ribes-Ginera et al. (2016) found increased collaboration, and also student satisfaction through the use of co-creation. Kaminskiene et al. (2020) described the main components of co-creation to include collaborative process and output, metacognitive processes, learner's agency, new learning spaces,

self-authorship, transformative interactions, and the previously mentioned learning communities. Iversen and Pedersen (2017) cite an alternative description of curriculum co-creation, citing work by Scharmer (2007), focusing on "sources of attention" with an emphasis on moving away from the "I-in me" (traditional teaching styles including lectures) to approaches including the "I-in it" (analysis, discussion), the "I-in-you" (listening, reflection), and the "I in now" which focuses on generative dialogue such as observation, insight, and interaction. Yet another interesting perspective is one by McWilliam (2008) where the outcome of co-creation is to move from "sage on the stage" (lectures, presentations) and the "guide on the side" (instructor guides students through projects and exercises), to what is termed as "meddler in the middle" (both teachers and students are involved as creators of the learning process).

Educational design using co-creation can be described as transformational, in that it is changes how students think and work, and also that it can represent a change in metacognitive understandings about learning (Lubicz-Nawrocka and Bovill, 2021; Cook-Sather, Bovill, and Felten, 2014). This is related to what Barnett (2004) describes as a "sense of being" which describes one's concepts about contributions to society and education. Closely related to this is the need for participants to have a dialogue about partnership, and also negotiate the tasks involved with curriculum decision making (Lubicz-Nawrocka, 2020). In essence, the concept should be that students are no longer solely passive recipients of information from instructors, but rather are partners in the educational process. So, while it is true that to a large extent students learn from instructors, the reverse can also be true.

Curriculum Co-Creation Components, Issues, and Factors

There are several ways from which curriculum co-creation can be approached from a theoretical perspective. One is from a knowledge management approach; and the other more based on educational theories. We present the concept of co-creation first as being related closely to the theory of knowledge appropriation and knowledge maturation. From there, various related educational theories and pedagogical methods are presented.

While the implementation of curriculum co-creation can range from being relatively simple and straightforward, requiring little more than the efforts of an instructor working together with students from a course; to being a significantly more complex program which may encompass multiple individuals, an organization structure, or even a scope which covers multiple disciplines, schools, and even funding to support the initiative. The factors and consideration which are important with regards to the implementation are discussed in a later section.

To start, our goal is to look at curriculum co-creation broadly from a theoretical knowledge management perspective. A good place to start would be the knowledge appropriation model. This is a model which attempts to explain the dynamics of how knowledge from an individual is transferred and used in the context of socialized communities and groups. In other words, how knowledge is shared with others, and then is enhanced through the interaction with other "experts" in that same area. The process of transfer and enhancement are related to the goal of creating knowledge (Maier and Schmidt, 2014; Rogoff, 1995; Nonaka et al, 2006; Wenger, 2004). The sharing of individual knowledge in groups and communities of experts, has as its result the creation of knowledge which is more mature and suitable for use in a workplace environment.

One of the foundations of this model is its series of knowledge maturation processes (Maier and Schmidt, 2014). These knowledge maturation processes include the focus on an idea (appropriating an idea), sharing it with a group, co-creating a solution or result with the group, formalizing it more concretely, and finally releasing it in a form which makes its dissemination and use more acceptable and likely. Closely tied in with this are appropriation practices, which including creating awareness about this new knowledge or solution, building shared understanding (often to other contexts), adapting the solution to a wider variety of situations, and finding ways to validate this new solution in the learning or educational community. It could be said that this constitutes the "creation" aspects of the process (Ley et al, 2018; Maier and Schmidt, 2014).

When engaged in knowledge appropriation, there is a need for scaffolding, where the goal is to acquaint, train, and assists teachers into the use of the solutions obtained. These methods include guiding (providing advice), seeking help (receiving support and assistant from someone more familiar with the knowledge-based solution), and fading (where there is a gradual reduction in help and support as the learner adapts to using the solution). The three main concepts of appropriation, maturation, and scaffolding work in an interrelated process to generate, mature, and disseminate/apply new knowledge. (Ley et al, 2018; Maier and Schmidt, 2014). The theories of knowledge appropriate and knowledge maturation support the concept of "co-creation" where knowledge is further "enhanced" and "matured."

Before examining the educational theories and pedagogical methods which are related to curriculum co-creation, it would be useful to define a structure of how these fit together in producing a successful co-creation outcome. The parts of this structure include:

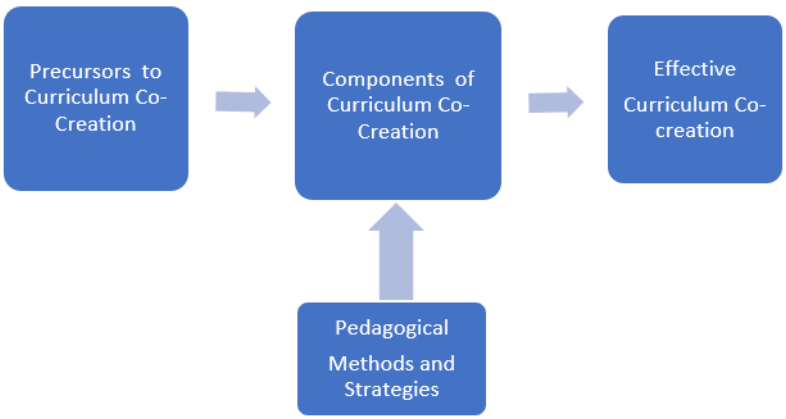
- **Precursors to co-creation:** These are the desired conditions and pre-requisites to maximizing the success of a co-creation program or initiative.
- **Components of co-creation:** These are the states and outcomes which are sought after and used when doing an effective co-creation exercise or program. These components can also be reflected in the course or curriculum output result from the co-creation.
- **Pedagogical methods and strategies:** These can be thought of as a set of "moderating factors" in that the proper usage of methods and strategies can help maximize and improve the co-creation process and result overall. The use of new methods and approaches would help to enable students to take on the role of "stakeholders" in the co-creation process. Field studies, narratives, dialogue, interviews, and technology-enhanced methods including digital storytelling and flipped classes are ways that can enable the flow of ideas during the co-creation process, and also can be employed in the co-created curriculums.

These three parts of the structure are shown in Figure 1.

Precursors to Co-Creation

Non-hierarchical relationships. Usually, students are regarded as taking on a generally passive or "receiver" role in terms of the course or classroom relationship, and this needs to change if effective curriculum co-creation is to occur. In essence, there is a shift in the power dynamic, which brings about the concept of a peer relationship, or as a partner in the designation "students as partners."

Figure 1. Curriculum Co-Creation Structure



There needs to be a sense of adjustment, and also negotiation and a shared sense of agreement as to the new roles which exist and how they are to be conducted during the co-creation process (Kaminskiene et al, 2020).

Flexibility of curriculum. The curriculum needs to be sufficiently flexible that it can accommodate the feedback, revised teaching methods, and other proposed modifications which are suggested after completion of the co-creation process. This means that the curriculum is in such a form that change is possible, and also that instructors will be able to help sort through and manage the various inputs into a form which can be assimilated into the new co-created curriculum (Kaminskiene et al, 2020).

Assessments also play a role, with special attention placed to in the areas of peer assessment and peer review. While the traditional role is for instructors to create and evaluate assessments, there are benefits to be obtained in moving towards a peer assessment model, where students also have a role in evaluating other students' work. It also should be mentioned again that scaffolding is an important part of the co-creation process when it comes to co-creating curriculums, given the new roles that students take on in the process (Kaminskiene et al, 2020).

Another concept which is a precursor of curriculum co-creation is the broad concept of active student participation (ASP), which goes beyond the act of students studying at an institution, or the means of assisting certain student populations to adapt to university-level education. The term actually refers to students engaging in various kinds of experiences at an educational institution. Serving as a student representative, participating in school activities, or engaging in a learning-oriented activity all qualify as ASP endeavors (Furlong and Cartmel, 2009; Marton and Saljo, 1997; Entwistle, 1988).

While originating from literature on community planning, the idea of active participation helping to improve the community and adjusting long-held power structures, was the starting point to active participation in other areas (Hickey and Mohan, 2004). In particular, the work by Aronowitz (1994), Shor (1992), and Rogers and Frieberg (1969) suggest that students should "reverse the passive experience of learning" and become more actively involved in curriculum planning. Inherent within this is the suggestion that universities should make opportunities available to have students be viable and important "partners in learning."

A model of active student participation in curriculum design was proposed by Bovill and Bulley (2011), building upon an earlier model proposed by Arnstein (1969) and using terms more relevant to education and curriculum (Fraser and Bosanquet, 2006). This is in the form of a "ladder" which shows the levels of students' active participation in curriculum design starting with "dictated curriculum- no interaction" at the bottom, to limited choice (specific areas where students can participate), to higher levels where students have some influence, all the way to the top, where there is a "partnership" and students have significant influence and decision-making control. The various rungs of the ladder in the model are hypothetical and attempt to represent all possible levels of student participation, although they may not in all respects represent reality, since it may be difficult to find actual examples from practice for all of these levels of participation. It would be more accurate to say that the model is a good starting point from which to gauge what level students' participation are at currently, and to use it to suggest where a curriculum co-creation initiative can be headed, towards its intended and stated goals (Bovill and Bulley, 2011). What kinds of results are desired when using this process? In other words, what do you want to bring about, in using co-creation? While obtaining new and different perspectives on courses, curriculum content, and assessments are desirable, another benefit is that students who participate can develop higher levels of learning, and also employ more innovative approaches in their recommendations for courses and curriculums. Clearly, active student participation is one of the concepts that is an important precursor of curriculum co-creation projects and activities.

Components of Curriculum Co-Creation

In general, there are several educational theories (and their related methods) which take on the role of components or aspects of co-creation, both relating to the process, and the co-created results.

To start, it helps to encourage students to operate at a higher level of learning. In line with this, the concepts of constructivist learning and also the higher levels of learning described in Bloom's Taxonomy, are useful to examine. It was mentioned previously that the traditional lecture style of teaching, and the "information transfer" approach, are considered the traditional approach, which some refer to as being "objectivist." This can be contrasted to the constructivist approach, where both the instructor and the students take on a different role. The effect is to have more emphasis on students and their learning process, rather than on the content and the means of delivering it. Constructivist activities involve the solving of a problem or approaching a situation using a number of steps, which students can become engaged in, reflect upon, and given further thought about. In effect, the instructor becomes more of a facilitator with the goal of helping students through the learning process. This is sometimes described from the instructor's perspective as moving from a "sage on the stage" to a "guide on the side" role (King, 1993).

Constructivism emphasizes a cognitive approach to learning, where students can gain insight and obtain a better understanding of one's world through various activities (Vygotsky, 1978; Piaget, 1970; Dewey, 1938). Typical activities can include class discussions, experimentation, research projects, and field trips (reference). Interactivity, active involvement, student initiative and responsibility for learning are emphasized (Gray, 2002). For online learning, the use of weblogs, discussion forums, and wikis can help meet these goals. Because constructivist approaches attempt to teach by expanding upon prior knowledge, students tend to become more actively engaged in the learning process.

An important goal for instructors using this approach is to encourage critical and insightful discussion to help students develop their own conclusions on a subject. Instructors then assume the role of facilitator, and use coaching, modeling, and scaffolding to guide and support students learning new concepts or skills.

The learning goals in constructivist environments can take several forms, including finding solutions to address a specific problem, deepening understanding of an issue, and developing questions that can lead to more effective research. Tasks should be relevant and engaging, but not necessarily highly structured (Ashcraft, Treadwell and Kumar, 2008).

The concept of higher-level learning can be expressed as a progression in the acquisition of knowledge and skills, from lower-level and "simpler" forms of learning, to higher, more complex levels of learning (Felder and Brent, 2004). The most up-to date categorization of this is the taxonomy introduced by Anderson and Krathwohl (2001), which is a revision and enhancement of the original model known as Bloom's taxonomy. The lower levels of the hierarchy represent lowers levels of learning, such as memorizing facts and demonstrating comprehensive, which then moves up the taxonomy to levels which represent analysis, synthesis, and evaluation (Bloom et al, 1956).

Experiential Learning is a concept where learning happens in a series of learning cycles, which includes observation, experimentation, conceptualization, and actual experience. It could be said that through experiential learning, someone learns from one's own personalized and unique experiences (Kolb, 1984; Kolb 1981). Having the goal of effectiveness in co-creating teaching and curriculums, it is not enough to be satisfied with presenting information by delivering facts, definitions, and other direct forms of knowledge such as that obtained through a lecture. Rather, it is necessary to acquire some of one's knowledge through experience, which consists of a series of steps including concrete experience, reflective observation, abstract conceptualization, and active experimentation. Inherent in this approach is what is known as a learning cycle whereby someone can learn through experience and gain insight into how to approach and manage specific situations, as one progresses through the cycle. Examples of experiential learning include activities such as reflection, creating journals, role playing, simulations and games, and internships. (Kolb et al, 2001; Kolb, 2008; Kolb, 1984).

Action Learning is a theory which states that action is the medium through which learning happens. The ideal form of learning should be "self-directed" and "learn by doing" rather than simply receiving information from an instructor. It focuses on a structure whereby someone can plan

one's own approaches to learning (Chenhall and Chermack, 2010). Some of the elements of action learning include personal reflection on experiences, managing and evaluating real-world issues, and also employing a social aspect to learning, where individuals learn in small groups to analyze, solve issues, develop solutions, and implement recommendations (Bowerman, 2003; Smith and O'Neil, 2003; Conger and Toegel, 2003).

Action and learning work hand in hand, to bring about learning there must be actions performed. One description of action learning by Revans (2011) cites four separate activities which make up the full "syndrome" of action learning: experiential learning, relevant knowledge acquisition, creative problem solving, and co-learner group support. All of these components describe components which comprise the total experience of doing active learning.

Some researchers have suggested that having students and faculty work together to develop course content, curriculum topics, and assessments represents a different kind of interaction, where non-traditional roles, relationships, and processes can operate to produce productive results. This is what is known as the Third Space, or alternately, a "zone of proximal development." Given that curriculum co-creation fosters an environment where students work in unconventional ways with teachers, in some ways resembling a peer role, the notion of the Third Space has been applied to curriculum co-creation activities, with the goal of developing better courses and curriculums (Lubicz-Nawrocka, 2019; Gutierrez, 2008; Bhabha, 2004).

Closely related to the concept of the Third Space is that of Educational Living Labs. These are experimental, test environments devoted to supporting both co-creation and learning (Mele et. al, 2009). This concept is associated with the idea of open innovation networks with this specific model being known as a Living Lab. A Living Lab can be a physical or virtual space where products, services, and technologies are created, validated, and tested. The main goal is user evaluation where testing and experimentation are done in simulated real-world settings, and where the participants generally operate on an equal status, as co-creators (Schuurman et al, 2011; Almirall and Waremam, 2008; Westerlund and Leminen, 2011). There are examples of studies and initiatives where the living labs concept has been employed. These include the living labs Go Lab, SmartZoos, and Robomathematics Living Lab. GoLab was concerned with preparing STEM-oriented educational teaching materials, while SmartZoos focuses on learning activities relating to animals and wildlife. Finally, Robomathematics had as its goal the creation of school materials using robots. As a specialized kind of working environment for specific topic areas, creation of a living lab environment can be an effective outcome for certain kinds of learning experiences.

While much of the attention given to curriculum co-creation is focused on the roles and benefits associated with student participation in the course and curriculum design process, there are situations, such as in the case of educational living labs, where the co-creation is conducted among school teachers, school and university administrators, university professors, and educational researchers. These are known as school-university partnerships (SUP). The goal is to do co-creation in the context of a learning lab which is focused on a specific subject or topic area, or have a unifying theme enabling a discussion on a variety of educational topics relevant within this theme (Ley et al, 2018).

Metacognitive practices are those which support and encourage a greater awareness of what is being learned, often exhibited through critical analysis and reflection. The basic concept behind metacognition is gaining the ability of "learning how to learn." (Tanaka et al, 2016). Metacognition implies a greater understanding of one's own knowledge levels and performance, which goes beyond memorizing facts for a test or repeating the concepts taught by an instructor. Instead of receiving facts or basic units of information (such as listening to a passive lecture), the ability to do metacognition means that one can actively construct knowledge, and constantly "develop oneself" through the learning activity. An example of a metacognitive class activity can be generally along the lines of a problem or situation whereby there is no clear solution or answer, and where a clear unified "answer" is not necessarily sought. Rather, the goal is to have participants propose and justify solutions to other participants, with the justification and thought process being a part of the metacognitive learning.

While different participants can have different solutions (and accompanying rationales), the ability for the various students to not only provide reasons for one's own solution, while also anticipating and being able to respond to the ideas of others, allows for the building of metacognitive skills. The tasks of reflection and critical thinking are highly relevant and important in this process (Keeling and Hersh, 2011). This method of learning is intended to develop students to become "knowledgeable learners" and "thinkers" rather than "imitative learners" who simply try to copy the knowledge of an expert such as the teacher (Bruner, 1996).

To help develop the metacognitive skills necessary for co-creation, there is a need to use experiential learning, described earlier, in the learning process (Kolb, 1984). This helps to create the ideal state of becoming an adaptive expert, which combines the strengths of innovation and efficiency, and also exhibits an understanding and use of metacognitive skills (Tanaka et al, 2016; Coleman et. al, 1997; Bransford et al, 2006; Hatana et el, 1986). As a result, the co-creation of curriculums helps students to develop their metacognitive skills.

Learner's agency is another concept which can be related to curriculum co-creation, in that the process enables a learner to progress towards being "more than a student" and to take on a more active role in the learning process. This allows for the creation of more learner-centered approaches, which exhibit the benefits of both students and instructors being active partners and change agents (Lubicz-Nawrocka, 2019; Carey, 2013; Loyens and Gijbels, 2008). In fact, there are two models which have been developed which relate to increased role of learner's agency in the process. Bovill et al. (2016) discusses the various roles including consultant teaching, representative, co-researcher, and pedagogical co-designer, while Dunne and Zandstra (2011) identified the categories as being evaluators, participants, partners, and agents for change. Students who develop a sense of learner's agency can become productive contributors to the co-creation process.

Self-authorship (Baxter Magolda, 1999) refers to the fact that students who participate in co-creation, are able to integrate knowledge evaluation and construction, with ones's own values, beliefs, and goals. This results in a working situation where there is mutual learning, and also results in greater levels of critical thinking, application of theory towards practice, and development of cognitive skills and awareness. It is claimed that the process of doing curriculum co-creation improves levels of self-authorship among the students who participate.

Educational Theories and Pedagogical Methods Supporting Curriculum Co-Creation

There are a wide range of educational theories and concept which relate to and are considered components of curriculum co-creation, and so Table 1 was created to identify and describe the various theories and how they relate to the concepts and processes associated with curriculum co-creation. The table cites the theory, a brief description of its main concepts, and examples of its implementation in a classroom environment. The "components" of co-creation referenced earlier, are supported by the theories shown in Table 1.

Factors Impacting Curriculum Co-Creation Implementation

Now that the relevant theories have been discussed and explained, the factors and variables which should be looked into with regards to co-creation of courses and curriculums is discussed in this section. Whether an educational organization is seeking to do a study employing course/curriculum co-creation, wants to evaluate one's study in the context of other work done, or wants to review other research on the area, the factors and variables involved are presented here.

Suitability and Readiness for Co-Creation

A key requirement for effective co-creation of curriculums and courses requires that a different mindset be employed in the educational process. Instead of a primary teaching focus on

Table 1. Educational theories supporting curriculum co-creation

Theory/Concept	Description	Examples
Constructivist Learning Vygotsky, 1978; Piaget, 1970; Dewey, 1938	Learners construct knowledge, rather than passively accept information.	Discussions Projects Researching subjects
Higher Orders of Learning Bloom's Taxonomy Anderson and Krathwohl, 2001; Bloom, 1956	Levels of learning progress from higher, deeper forms to lower forms	Lower: Conceptual lecture Objective tests Higher: Problem solving Critical thinking Reflection
Experiential Learning (Kolb, 1984, 1981, 2008; Kolb et al, 2001)	Learning from personalized experiences; Learning cycles	Internships Field Exercises Research Lab Exercises
Action Learning	Self-directed, learn by doing. Reflection, real-world issues.	Business simulations Problem solving
Third Space Bhabka, 2004	Known as "zone of proximal development." Social environment where different dynamics can take place	Curriculum Co-creation activities where instructors and students take different, more equal roles.
Educational Living Labs	Experimental test environments for testing products, services, technologies.	GoLab SmartZoo Robomathematics
Metacognition	The method of understanding "how to learn"	"Solving a Problem" oriented activities, often solution is not clear
Learner's Agency	Improvement to student's role(s) in the learning process	Student feedback Reflection Personalized learning
Self Authorship	Integrate knowledge evaluation/ construction with one's own values and beliefs	Trust Internal Voice Build Internal Foundations Secure Internal Commitments

the delivery of information through lectures and presentations, a more active approach to learning needs to be encouraged and promoted. In connection with this, students should be encouraged to not merely be receivers of knowledge, but to apply and contribute to knowledge as a result of their learning process. The learning process should ideally need to be more applied and experiential in nature, and allow students to apply their knowledge. Assessments and evaluations should evolve from merely repeating back the information taught, to being able to extend, apply, and effectively employ this knowledge to different solutions. One of the important factors before attempting co-creation is to move away from a total reliance on passive lectures and traditional approaches, towards a more active and applied focus (Cook-Sather and Matthews, 2021).

Challenges to Co-Creation

Despite the benefits which can come from curriculum co-creation, there are a number of challenges and constraints which ideally need to be understood and addressed before effective co-creation can be attempted. These range from behavioral issues and selection criteria, to those inherent in the courses, curriculum, or the institution (Cook-Sather and Matthews, 2021).

- **Time and Resistance:** As a start, preparing a co-creation exercise takes time to prepare and set up, on the part of the instructor. However, this time could be considered well spent towards gaining insights into how to improve a course or an educational curriculum. However, a greater challenge may come about in the form of reluctance or resistance from students, who feel it would take too much of their time, be overly difficult, and overall is regarded as not being a sound concept and a waste of time, or may result in conflict with other students or the instructor. One solution to this is to have reasonable expectations, and to explain the rationale, expectations, and goals very clearly and in detail so that there is no confusion or misunderstanding. The other side of this issue is that instructors may resist doing co-creation, because it instills a sense that they have "lost control" of the courses and curriculum (Darso, 2017; Iversen and Pedersen, 2017). As a result, the dynamics of these co-creation interactions may require the employment of negotiations relating to making decisions in a shared manner (Bovill et al, 2013). For example, there may be guidelines and ground rules established to facilitate the free exchange of information amount the "peers" participating in the co-creation process.
- **Inclusion:** Another issue which has come up and has been documented in previous research, is dealing with the fact that while frequently a few individuals or a group of students are selected to participate in co-creation meetings, this in effect excludes other members of the class. This brings up the question of whether entire classes should be included to co-create, or whether there is an acceptable reason or rationale to select only certain students (Bovill, 2020). The issues involved with both include that of fairness and equity, as well as whether more limited feedback and opinions are sufficient (selected student participants) or if a broader group would offer a more balanced and thorough set of suggestions and recommendations.
- **Curriculum Limitations:** Whether based on restrictions relating to accreditation requirements or your institution's policies, there may be aspects of the curriculum that cannot be changed. In addition, there can be limitations imposed by state and governmental regulations, legal aspects, financial, budget, and enrollment considerations, and staffing issues. All of these can impact upon the curriculum (or course) that is being revised or designed. The best course of action here is to make yourself aware of these and work within these constraints to come up with a better offering overall. Does your budget allow for the implementation of new approaches to learning (and whether software or tools are needed), and is staffing sufficient to support innovative approaches?
- **Resource Limitations:** The lack of resources, whether financial, staffing, or administrative, can also limit the possibilities of doing an effective curriculum co-creation initiative. It would be helpful to re-focus and reframe your goals and expectations, taking these into account, before planning your initiative. Some possibilities to consider include employing student work-study, teaching assistants, and administrative staff to assist with these endeavors, or to apply any funds available for special programs or innovation initiatives towards co-creation. In particular, some universities and schools actually have divisions devoted to "learning with technology" or "engaged learning" which support curriculum co-creation related efforts.

Variables and Issues Relating to Curriculum Co-Creation

In order to properly assess and examine the research and work which has been done on curriculum co-creation, is it necessary to examine the various variables and issues which describe and define the elements of the initiatives and studies in this area. Upon understanding these elements and how they fit together and influence the results, then it is possible to better categorize, apply a structure to, and evaluate the studies and programs which have been conducted.

- **Who:** The term "who" can relate both to who initiates the work, and also who participates. Most commonly, the initiative is started by faculty or administrative staff, compared with instances where they have been initiated by students. The first is the more common occurrence, with the

latter only happening in certain situations where there is a high level of trust and respect for student-based initiatives. As a result, student-based projects may be more common in environments where there have been established opportunities within the organization and this kind of proposal is welcome (Bovill, 2019).

The participants would most likely would include students, instructors, and possibly school/university administrators. In particular, the student participants can consist of a single student, small groups of students, or entire classes of students.

Bryson et. al (2015) looks at the issue of partnership roles based on a 2 level dichotomy: Model A where a selected group of students are invited to provide inputs, as opposed to Model B where all students in a course are invited to participate. To enable inclusivity and gaining the widest range of feedback, there may be benefits to employing more of a Model B, or as Bovill (2020) explains it, as a "whole class approach." It should be kept in mind that while an instructor may offer the students enrolled in an entire class to participate, it does not necessarily guarantee that an entire class will be involved. Some students may not want to participate at all, while others may be more willing to participate in specific or limited ways. Some of this may be related to the level of positive relationship that has been established between the instructor and the students in the class, which may vary widely across those enrolled. In any case, it may be wise to consider what would be the alternate "Plan B or C" to offer to those students who either do not want to participate at all, or only in a specific manner. If course credit is the incentive given to the students, perhaps some form of alternate assignment may be offered so that non-participants will not receive a grade penalty.

Decisions can be made based on available resources, the method of interaction chosen, and what kind of feedback and response is required. The issue of selection (how and whether to select certain students to participate) and inclusion (whether it is fair to select certain students while not including others) are critical considerations whenever curriculum co-creation is being planned. The selection of students can be also be categorized based on whether they are previous students, current students, or those who intend to take a course or program. The students involved can also be identified by what year of school they are in, assuming that we are discussing only undergraduate students (Bovill, 2014).

- **When:** One aspect to consider is now long the co-creation exercise or initiative is expected to last. Would it be single session, or multiple sessions spanning a short, or a longer time period ? This is an important consideration. In addition, there is the factor of choosing when the co-creation is to happen, whether prior to the course or program being offered, while it is running, or after a course/program has been completed. The differentiation can be made by specifying the difference between "co-creation in the curriculum" (done while the program or course is being conducted) and also "co-creation of the curriculum" which happens before the course or curriculum has been run or started (Bovill and Woolmer, 2018). Not surprisingly, the perspectives can be quite different based on when the input is sought (Bovill, 2019).
- **What:** Attention should be placed on what is the focus of the co-creation. While there admittedly may be some overlap in these, Healey et al. (2014) describe that the areas of attention can be on curriculum design, subject-based research, learning teaching and assessment, or the scholarship of teaching and learning. More specifically, the focus can be on the content or topics chosen, teaching approaches used, evaluation and assessments employed, as well as materials and modality. There can also be key differences based on discipline and course level. Some co-creation exercises have focused less on the curriculum itself, and more on the "student experience" including campus services and culture (Johinke et al, 2018).
- **Goal/Objective:** What is the main goal or objective for the co-creation? Is the focus on teaching methods and approaches in a course, the assignments or assessments used in a course, the content or topics, or aspects of an entire curriculum? Co-creation exercises should have an end goal

or objective, as the purpose for the initiative or project. The goal of the project can be limited and focused, such those relating to the topics or activities related to a specific course, or about the courses to be included in a curriculum, or to suggest improvements or enhancements to an existing curriculum. You can think of this as the "deliverables" that you want to produce as a result of the co-creation activity.

- **Scope:** What is the scope of the initiative, such as whether it covers a single course, a group of courses, or an entire concentration, minor, or major in an educational program? The breadth of the inquiry is yet another critical factor to consider when evaluation curriculum co-creation efforts.
- **Perspective/Type:** What is the approach of the co-creation that is being using in this project or initiative? Here, we are not talking about the what kind of co-creation work is being done, but rather that is the focus or perspective of the participants. For instance, students can be providing feedback on a course they are currently attending, of a course or curriculum which is proposed and will be offered, discussing their experiences and recommendations for student services or processes, or researching additional information in relation to a course or curriculum. Examples of different perspectives can include that of alumni, potential majors in an area of specialization, or current students who are currently undergoing a program of study at that institution.
- **Roles/Nature of Participation:** Yet another critical aspect of curriculum co-creation is the determination of the roles that students play in the co-creation process. One of the more widely discussed set of roles is presented by Bovill et al. (2016) which describes four separate roles including the student representative, consultant/intern, co-researcher, and pedagogical co-designer. While these roles are presented as separate and distinct entities, there can be overlap between each of these. The student representative is the case where a smaller group of students (possibly elected or selected) represent a larger number or group of students. The consultant/intern role is usually designated by the instructor and those selected may receive compensation for participating in the co-creation activity, since those who are selected are those who are thought to be able to provide better levels of feedback and contribution. The co-researcher role works with instructors or staff to conduct research into the course topics, or teaching/learning approaches. The pedagogical co-designer takes on a greater responsibility for actually designing various aspects of the teaching, learning, and assessment.
- **Selection:** As mentioned previously, the students selected to participate in co-creation have an impact on the results. Whether based on specific criteria, availability or willingness, or a whole class approach, which students are selected is another key variable for curriculum co-creation. Bovill (2019) discusses the advantages and disadvantages of a whole-class versus a selected students approach to curriculum co-creation.
- **Duration:** How long does the co-creation activity last? It can range from a few hours, a few days, the length of a course, or through several courses. Certainly, the volume, type, and form of information received can vary a lot in relation to how lengthy the co-creation is done. As an example, the insights gained from those attending a single course, will be far more limited and specific, compared, for example, to students who attend a baccalaureate degree in business administration, and are asked to provide inputs about their educational experience over the entire span of their college studies.
- **Incentive:** In many of the studies and initiatives conducted, there is some form of compensation offered for participation, since the involvement does take up students' time and offering extrinsic motivation (money etc.) helps to improve satisfaction and a willingness to participate. If the co-creation is being conducted during the running of the course, the offering of course credit may be an acceptable form of compensation. If done outside of a course, some form of payment may be appropriate, while also keeping in mind that it is important to maintain a sense of equity and fairness, relating to selection and participation (Mercer-Mapstone and Bovill, 2019).

Categories of Curriculum Co-Creation Work

There are a number of specific categories of co-creation activities, and so the following terms are frequently used when describing different types of curriculum co-creation. Four type categories were proposed by Cook Sather and Matthews (2021).

- **Pedagogy consultation:** This application of curriculum co-creation is where some students are selected (or volunteer) to provide inputs on the teaching and learning. A main characteristic of this kind of initiative is that a selected few or group of students are selected or invited to participate, and then the focus is on a specific topic or group of topics, and in a sense they act as "consultants" because they completed the course and can offer their perspectives and suggestions as to the course and how it can be improved.
- **Co-creation classroom:** This is a kind of co-creation which is conducted with an entire class, in order to gather feedback and inputs on the topics, teaching style, assignments and assessments for the course being taught. A characteristic of this is that the entire class is participating, rather than a selected group of students, and therefore it is possible to obtain a more complete view of the opinions of the students. The idea of a whole class co-creation classroom is to ensure equity by having all students be offered an equal opportunity to participate, which also helps to reduce the possibility that the insights obtained are representative of only a few members of the class, and may not be a valid gauge of the opinions of the entire class.
- **Co-design curriculum:** This is the situation where students are asked to assist in designing a curriculum, which can be done either before, during, or after a course or sequence of courses. The demands of this kind of role may be greater, in that more details of the curriculum may need to be addressed, and in some cases may encompass multiple courses which comprise an entire curriculum for a concentration, minor, major, or an entire degree program. The audience, topics, credit hours, and a variety of other details may need to be addressed.
- **Curriculum knowledge co-creation:** This is a form of co-creation whether the goal is further research knowledge in a collaborative fashion, including methods to more effectively run a specific course or teach a specific subject, improve pedagogical methods, propose improved assignments, or improve student motivation and engagement. This type of endeavor can be focused more in general on these areas, rather than focusing on the specifics of a specific course. While the information obtained using this initiative may not be directly linked to specific courses and curriculums, indirectly they are used to help improve and enhance existing and proposed courses and curriculums for that educational institution.

Research Framework for Curriculum KCC Studies

Because there are a wide range of studies which have been conducted with regards to knowledge co-creation for curriculums, it would be useful and helpful to have a framework or structure from which to evaluate the studies, since many are quite different with regards to their goals/focus, course subject matters, students and other stakeholders involved, procedures, and timing of the co-creation related exercises or sessions.

The following research framework in Table 2 shows in a tabular form the various considerations and variables which define the co-creation studies and initiatives done so far, so that it could be used to categorize the studies which have been done. This will allow for the easier identification of what kinds of examinations have been done, and what areas could benefit from additional investigation.

Curriculum Co-Creation Projects and Initiatives

There is a wide variability in the attention that curriculum co-creation is given by educational institutions. The focus and resources given to this area can range from no attention at all, to large scale

Table 2. Curriculum co-creation research framework

Issue/ Variable	Description	Options Employed	Notes/ Findings/ References	Future Research Areas
Who?	The participants in the co-creation. Who initiates and leads the co-creation? How many participate?	Students (previous, current, future) Instructors Administrators/ other staff	Most co-creation done with groups of students, instructors, sometimes administrators Most often, instructors or administration initiate and lead.	Special populations of students: Adult learners Graduate students Hybrid and accelerated program students Expansion of participation to student life staff, other staff and administration.
When?	When the co-creation is done, in relation to the course/curriculum	Before the course is run; before curriculum finalized During the course After the course/curriculum is run	Both types have been conducted.	Asynchronous modality for co-creation exercises Through LMS Mobile computing Social media
What? (Course Topic)	Course and/or curriculum; subject, level, modality	Course and subject School grade(s) or level Undergraduate courses Graduate courses Modality: In-person Modality: Online	Many studies done with university students	More research into online and hybrid course formats. Accelerated program and special population-specific courses Cross-disciplinary courses and curriculums.
Goal / Objective	Feedback on what aspects are desired?	Course topics/content Course teaching methods Course assignments or assessment Curriculum design Curriculum revision	A variety of studies done in the listed categories.	Greater focus on engaged learning methods. Role of peer assessment and feedback in curriculum. Impacts of technologies on computing (mobile, web2.0, etc.)
Scope	Breadth of the co-creation.	Single course Multiple Course Curriculum components (major, concentration, minor) Full curriculum	A variety of studies done in the listed categories.	Specification of the best practices for different co-creation scope levels.
Perspective/ Type	What is the perspective/ type of the co-creation activity ?	In the curriculum (while course or program is running) Of the Curriculum (before course or program is running) Research and Evaluation Discipline-specific Research Student experience at the institution	A variety of studies done in the listed categories.	Moving beyond established approaches to curriculum co-creation
Roles/ Participation	What role(s) are the students assuming during the co-creation?	Representative Consultant Co-researcher Pedagogical co-designer	What role type(s) are assigned to students in this exercise?	New roles can be defined for student participants.
Selection	Which students participate?	Selected Whole-Class	How are the participating students selected? Or it is a "course assignment" for all?	Model or criteria for what kinds of courses/curriculum work best with varied student participants. Selection criteria
Duration (Time Span)	How long does the co-creation last?	Short-Term (few days or a week) Medium Term (Several weeks to several months) Long Term (Months to Years)	Does it span sessions just to do the exercise? Does it span an entire course? Does it span multiple courses?	Examining what kinds of outcomes emerge from varying durations of co-creation.
Incentive(s)	What incentives are offered for participation?	Course/class credit Vouchers/credits Monetary payment Refreshments/gifts	Incentives are necessary to ensure effective participation.	Does a certain kind of incentive produce better results?

initiatives where co-creation is applied across different courses and subjects to examine, evaluate, create, and enhance courses and curriculums.

In particular, there have been numerous studies conducted at specific universities. While there are programs and studies of this nature throughout the world, in particular, North America including the United States and Canada, United Kingdom, and Australia have been on the forefront on advancing the area of knowledge co-creation. Some of the universities have initiatives or programs focused on interaction and inquiry in this area, a number of faculty have conducted studies and written scholarly papers on their findings, and in some cases, portions of the university's websites are devoted to their work in this area.

Table 3 includes a listing of a number of universities involved with curriculum co-creation work, having designed studies and programs to solicit student input and feedback, conducted research in the area, and have shown some leadership in the field by having their faculty publish extensively in this area. In many instances, the programs and initiatives are coordinated through a university-sponsored institute or office, often in conjunction with the "Teaching and Learning" initiatives of the university,

Table 3. Curriculum co-creation programs, initiatives, research

Region/ Country	University	Division/ School/ Discipline	Outcomes
North America *Elon University* USA	Elon University	Students as Partners (SaP) in Engaged learning	Programs to get student feedback on courses/curriculums through SaP initiatives.
North America USA	*Bryn Mawr and Haverton Colleges*	SaLT (Students as Learners and Teachers)	Faculty collaborate one-on-one with students, as a consultant on teaching matters.
North America: USA	*Brigham Young University*	CTL/SCOT (Students Consulting on Learning)	Student provide feedback about teaching and courses: through video, attending a class, interviews, etc.
North America: USA	*Smith College*	Pedagogical Partnership Program	Feedback sought on selected courses during the semester; students register for a "course" and also receive payment for their observations and also providing feedback
North America: Canada	McMaster University	Student Partners Program	Design courses, student/faculty resource development, research. Graduate and undergraduate level.
Europe: UK	*Birmingham City University*	CELT Cross-discipline Faculty work with students on teaching-related projects	Develop teaching methods together with students, in various disciplines.
Europe UK-Scotland	*University of Edinburgh*	Numerous programs conducted here	Courses in disciplines including psychology, philosophy, geosciences. 3rd, 4th year undergraduate; graduate.
Europe UK - England	*Kingston University*	Inclusive Curriculum Framework (ICF) Student Curriculum Consultant Programme (SCCP)	Goal is to create accessible and accommodating curriculum for students (including minority ethnic) which make up over 50% of students SCCP designed for diverse approaches to curriculum design.
Asia/Oceania: Australia	*University of Adelaide*	Design Thinking Framework (DTF)	Inquiry-based learning design Assessment review Discipline-specific performance and teaching

and/or one or more of the academic departments of the university. So, in some ways, the tasks of improving teaching and learning, normally associated with technology use for example, may also be associated with co-creation and improvements in "engaged learning." There are different kinds of implementations of these programs and initiatives. Some are done under the guidance of a faculty member together with an administrator or institute staff. Others may consist of a summer program where co-creation occurs, while others are offered in the form of grants for research work into this area. Students are solicited to participate with incentives of various kinds, including payment, course credit, and the like.

Practical and Managerial Significance of Curriculum Co-Creation

In light of the fact that curriculum co-creation changes many of the fundamental power structures in educational institutions, from where teachers and administrators determine the method and manner of course development and design, there are a number of critical factors which need to be taken into account.

To start, since educators previously were given almost complete authority with regards to courses and curriculums, they now need to adapt to an environment where this authority is shared with others, whether they be students, representatives from industry, or other relevant stakeholders. This would likely result in a cultural change which may need to be instituted and encouraged by the educational administration overseeing the curriculum. A challenge here may be countering the resistance from educators who have been ingrained with more traditional teacher-oriented approaches to curriculums.

In particular, the inclusion of industry and recruiting representatives may help to make a curriculum more up to date and attuned to the needs of the current job market. Even the inclusion of aspects and features recommended by students may result in greater satisfaction, not only from those students participating, but by those who will experience the new learning process.

Finally, many more institutions of learning could benefit from employing aspects of curriculum co-creation, and either due to a lack of awareness or familiarity, or a scarcity of resources, these may have prevented them from considering this approach. It appears that educational institutions and also the industries employing their graduates can benefit from working together to create educational programs and courses which better meet the needs of students in the 21st century.

SUMMARY AND CONCLUSION

The area of knowledge co-creation for curriculums has been an emerging and growing area of research and practice, designed to enhance and further improve the effective development of courses and curriculums. While there appears to be a strong theoretical basis to the concept, and numerous studies and initiatives have been conducted, it appears that this can still be considered to be an emerging area which is still in its relatively early stages given the overall levels of understanding, acceptance, and usage in the educational community. Coming under a variety of different names (co-creation, students as partners, engaged learning) the concept and its applications are currently used in a limited number of institutions, and most regions of the world engage in little or no curriculum co-creation. It is clear that additional research needs to be done to explore all of the various perspectives and applications which can be examined.

This paper started with how knowledge co-creation for curriculums is defined conceptually, followed by a review of relevant educational theories and methods. The various components and elements which impact the implementation of knowledge co-creation for curriculums are discussed as well.

A research framework for examining the variables associated with curriculum co-creation comes next, which details and categorizes how co-creation projects are initiated and structured.

Following this is a discussion of the various types of knowledge co-creation, which is then followed by a discussion of the different elements and considerations which come into play when conducting a curriculum co-creation initiative or study, with examples from the literature.

While there are a great many specific courses and curriculums which have been co-created, and a sizable number of academic papers published on the associated concepts, methods, and findings, much more work can and needs to be done. The final section looks at the area, and proposes a number of viable areas for future research.

In conclusion, it could be said that curriculum co-creation is an area of inquiry that is starting to become more accepted in the educational community. It does have a solid theoretical basis and is reported to have numerous positive aspects reported by participating students, and also has had shown meaningful results through improved courses and curriculums. However, there are cultural and established norms and power structures in place which also tend to bring about resistance due to the "reversed roles" of students giving advice to teachers and administrators about how teaching and learning. Given the importance that curriculums play in the overall realm of educational management, it is therefore important to consider curriculum co-creation as an important emerging approach which should not be ignored.

Areas for Future Research

There are a number of fruitful areas for future research in curriculum co-creation:

- **Social Media and Web 2.0:** The prevalence and use of social media and of web-based pedagogical methods is one area which is ripe for future research. Since co-creation for a curriculum is closely tied in with pedagogical technologies and methods, it would be useful to examine the impacts that a specific social media or Web 2.0 tool would impact the study and the results.
- **Online Courses:** Certainly, one of the developments which have taken the educational realm by storm has been the rapid growth of online courses and programs, including some schools and programs which conduct most of or all of their teaching online. While many of the studies profiled so far noted have been conducted on traditional campus-based environments, perhaps additional work should be conducted on the needs of learners who study primarily in an online environment. What would be the types of issues, considerations, and learning tools and approach which would be greatest interest and importance when a hybrid online or fully online course is being taught? What are the various support tools and resources which would be helpful to students undergoing an online course of study?
- **Mobile Computing and Learning:** (Lim Shelley and Heo, 2019) Mobile computing, done through smart phones, is yet another area which can be studied in the context of knowledge co-creation. Because of the unique platform and requirements for mobile computing and learning, it would useful to do co-creation using mobile computing-based or supported courses and programs. What would be the impacts and possible outcomes of co-creating mobile learning courses and curriculums ?
- **Special Populations (Adult Learners and Accelerated Courses):** Because the process of co-creation has as its goal the process of giving students a greater role and participation in developing and creating their own learning, it may seem logical that adult learners may be a population which would provide the best and most detailed feedback and inputs, given their age, experience, and maturity. Would there be improved results when co-creation is done with adult learners, as opposed to undergraduate students pursing a baccalaureate degree? There can also be work done to co-create courses and curriculums which are accelerated and compressed in nature, since the intense nature of these types of courses may have aspects and characteristics which may not be readily apparent to instructors and administrators, but may be very evident to students who undergo such course and programs.

- **Negotiations:** These are conducted as a part of curriculum co-creation (Bovill et al, 2013). Because of the fact that the dynamics of the instructor-student relationship are changed based on co-creation, there has been discussion of the fact that this results in the need to "negotiate" roles and status during this process. This area may not have been given sufficient attention and is a viable area for future research.
- **Course Subject Differences:** It may be interesting to examine if there are any differences in success depending on the subject area of the course being taught (and also from which co-creation is conducted). For instance, would there be more meaningful results gathered from courses in the humanities, arts, sciences?
- **Internationalization and Broad Acceptance of Curriculum Co-Creation:** Currently, the majority of the initiatives, programs, and research are occurring at selected universities in specific countries. A vast proportion of the world does not appear to participate or have interest in this area. What are the reasons for this, and what can be done to improve upon this? Are the reasons for this due to culture, educational regulations and norms, resource availability, or a lack of awareness as to the benefits of these approaches? This area could be an area which can yield interesting and substantial research inquiries, since there can be variances in the educational cultures, structures, and power-authority arrangements in different counties and regions of the world.

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