Spiral curriculum design

The spiral curriculum, a concept widely attributed to Jerome Brunner[1], refers to a curriculum plan in which key concepts are repeatedly presented throughout the curriculum, but as layers of complexity deepen, or in different applications. Such therapy allows the previous introduction of concepts traditionally reserved for later courses, more specialized in the curriculum, after students mastered some basic principles that are often highly theoretical and likely to discourage students who are keen to apply the concepts they are learning to real-world applications. How does this method help the student? Over the past few years, the Detroit Mercy Electrical and Computer Engineering Program (ECE) has designed and implemented such a spiral curriculum built on a robotics theme. All engineering students complete a hand robotics project in their first semester at the university that introduces mechatronic concepts. As ECE students progress through an integrated curriculum, they complete more sophisticated robotic projects, participating in courses that are heavily integrated together. How Figure X works: Electrical engineering's spiral-shaped X curriculum represents the spiral structure of the curriculum, showing how traditionally different topical areas are treated in integrated fashion in two principles courses (first fund and second fund). After the first fund, students began experiencing tight integration throughout the course. For example, joint projects across the second fund, signals and systems, and digital logic have been a consistent feature in the four years since the curriculum was launched. Signals and systems introduce concepts related to control and communication systems that are later amplified in two separate periods. The advanced electronic systems course continues to integrate with joint projects with the micropropriology period. All of these ready students think of EE design as a system integration problem rather than simply a set of unsealed component designs that will never be put together in a larger context. [1] J. S. Bruner, The process of education. Cambridge, MA: Harvard University Press, 1960. Download Full Text Issue: ED538282Record Type: Non-JournalPublication Date: 2012-MarPages: 2Abstractor: ERICISBN: N/AISSN: N/AThe Spiral Curriculum. Research into PracticeJohnston, HowardEducation Partnerships, Inc.The Spiral Curriculum is predicated on cognitive theory advanced by Jerome Bruner (1960), who wrote, We begin with the hypothesis that any subject can be taught in some intellectually honest form to any child at any stage of development. In other words, even the most complex material, if properly structured and presented, can be understood by very young children. The key features of the spiral curriculum based on Brunner's work are: (1) The student re-into a subject, theme or Several times during your school career; (2) The complexity of the subject or subject increases with each re-visit. And (3) New learning is related to old learning and has been placed in context with old information. The benefits attributed to the spiral curriculum are by its proponents: (1) strengthening and solid information every time the student re-hits the subject; (2) the spiral curriculum also allows logical progress from simplified ideas to complex ideas; and (3) encourages students to use basic knowledge to the goals of subsequent courses. Although there is no clear empirical evidence of the overall effects of the spiral curriculum on student learning, the characteristics of that curriculum have been linked to improved learning outcomes. In addition, the spiral curriculum includes many research-based approaches from cognitive science that have been individually linked to improved student performance. Education Partnerships, Company website: in a spiral curriculum, learning has expanded over time rather than being focused on shorter periods. In a spiral curriculum, the material is re-visited repeatedly over the months and across grades. Different terms are used to describe such an approach, including distributed and spacing. A spiral approach often contradicts blocked or mass approaches. In a mass approach, learning is concentrated in continuous blocks. In the design of educational materials, massization is more common than distance. Why does everyday mathematics spiral? Everyday mathematics (EM) spirals because the spiral works. When implemented as intended, the EM helix is effective: EM students outslid non-EM students comparable to long-term learning assessments, such as standardized year-end tests. Spiral leads to better long-term dominance of facts, skills and concepts. Spiral is effective with all learners, including combatant learners. Learning difficulties can be identified when skills and concepts are encountered in the early phases of the spiral and interventions are implemented when those skills and concepts are later re-encountered in the spiral. What is the basis of research for spiraling? The effect of distance - increasing learning from distribution rather than massive learning and practice - has been repeatedly found by researchers for more than 100 years. The findings are about distributed learning from the strongest in learning sciences, applied across a wide range of content and for all ages from infants to adults. Spatial learning over time is the first research-based recommendation in a recent practice guide from the U.S. Department of Education's Institute of Educational Sciences (Pashtler et al., 2007). Lisa Sone and Dominic Simon write in a recent review of literature: On the whole, In the laboratory and classroom, whether in adults or children, and in the areas of cognitive and motor learning, distance leads to better performance than massing (2012). Why does distance work better than massing? The reasons for the distance effect are not fully understood. One possibility is that massing reduces attention so that learning is weaker. Another possibility is that processing increases the effort of sorting involved in long-term retention interval learning. Easy learning often doesn't lead to the best maintenance; more difficult learning can lead to stronger erasing of information and better long-term learning (Schmidt & Bjork, 1992). This explanation identifies the effect of distance as an example of a desirable difficulty that enhances learning. The third possibility is that the spiral helps learners communicate over time, which creates stronger pathways to recall information. Multiple, strategically distanced and strategically progressing learning experiences may produce deeper and more conceptual learning. Why aren't more spiral-structured curricula built? Most curricula are not designed to take advantage of the distance effect, much to the frustration of psychologists who have documented its power (Dempster, 1988; Rohrer, 2009). One reason is that the gap effect is counter-intuitive: people feel that mass leads to higher performance, which is true in the short term - cramming works for the short term - but it's not true if the goal is long-term learning. People confuse short-term performance with long-term learning and incorrectly predict that mass practice will lead to better long-term learning than interval practice. UCLA psychologist Robert Björk uses the term delusional competence to describe that feeling (1999). Another reason the spiral is not common in curriculum design is that many teachers are unaware of the benefits of learning distance over time. Teachers may also be discouraged to realise how much their students forget, something more obvious by distance (where subjects are re-visited after students have had time to forget) than by mass (where subjects are not re-visited until amnesia is not as obvious). The third reason is that students find distance learning harder than mass learning, so they tend to prefer a mass approach even if it is less efficient. One final reason that spiral curricula are not common is that making such curricula complicated. Everyday mathematics, for example, weeds education, practice, and evaluation into complex patterns that extend over months and even years. Designing and building a spiral curriculum is more difficult than designing and building a conventional, mass curriculum, but as research shows, it's worth the effort. References Bjork, R.A. (1999). 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