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## **AC 2012-3904: CURRICULUM INCUBATION: DATA-DRIVEN INNOVATIVE INSTRUCTIONAL DESIGN**

### **Dr. Judith A. Sunderman, University of Illinois, Urbana-Champaign**

Judith Sunderman is a consultant focusing on program and curriculum development, research, and evaluation in education. She has recently served with the Illinois Foundry for Innovation in Engineering Education (iFoundry) at the University of Illinois, Urbana-Champaign, providing technical assistance for curriculum development. As evaluator with the I-STEM Education Initiative at the University of Illinois, Sunderman focused on small-scale evaluation using short-cycle, coached-change to increase academic performance. Other work has included evaluation of faculty training in P-12 career and technical education for the Illinois State Board of Higher Education/Illinois State University; research and evaluation for the Illinois Assessment and Accountability Project (Illinois State Board of Higher Education/University of Illinois); and the Entrepreneurial Leadership in STEM Teaching and Learning (Project EnLiST - National Science Foundation/University of Illinois). Her research focus and area of expertise is personal development, sustainable transformative learning environments, and curricular change. She has worked with curriculum/programs in a variety of areas, including teaching centers, engineering, business, honors, national scholarship advising, animal sciences, human resource development, and education. Sunderman received her Ph.D. in higher education leadership from the University of Illinois. She has an undergraduate degree in English from DePauw University and an M.B.A. from Eastern Illinois University.

### **Dr. Raymond L. Price, University of Illinois, Urbana-Champaign**

Professor Price was appointed to the William H. Severns Chair of Human Behavior in the College of Engineering in 1998. As the Severns Chair, his primary charter is to provide opportunities for engineering students to understand and develop skills in human behavior: interpersonal skills, leadership, teamwork, and management skills.

Currently, Professor Price is the Co-Director of the Illinois Foundry for Innovation in Engineering Education (iFoundry). The mission of iFoundry is to change radically the learning experiences of engineering students.

Dr. Price was the Founding Director of the Illinois Leadership Center from 2002-2006. The Center's mission is to encourage leadership development among Illinois students by providing opportunities to learn and then apply leadership skills.

Dr. Price initiated the Technology Entrepreneur Center in 1999 to support scientist and engineering entrepreneurs in the development and growth of new businesses. Through education, the Center prepares students to start and grow companies. Through a network of support, the Center surrounds entrepreneurs with a success environment that includes experienced advisors and viable investors.

Prior to joining the College of Engineering, Dr. Price had a career in industry working in management and organization development and human resources at Allergan, Boeing and Hewlett-Packard.

Dr. Price earned a PhD degree in Organizational Behavior from Stanford University.

# Curriculum Incubation: Data-driven Innovative Instructional Design

## Abstract

The curriculum incubator is a change strategy that nurtures innovative instructional design. Within the incubator, faculty test ideas outside of the official curriculum. The intention of this research and development process is to minimize early resistance and demonstrate methods that work.

This study probed faculty perceptions about incubator characteristics and effectiveness during the first year of operation. An existing instrument, the Situational Outlook Questionnaire (SOQ), which measures organizational capacity for innovation, was adapted for use.

Results indicated that faculty perceived high levels of nine characteristics called dimensions of innovation. Support for New Ideas and Time to Explore Ideas were identified as the most valuable. Results for the curriculum incubator compared favorably to earlier studies of organizations with a track record of innovation.

The wider significance of this study is about leadership. Within the secure environment of the curriculum incubator, individuals had the time and the opportunity to refine their teaching in ways that made personal sense, and moved the organization forward.

## Body of the Paper

The curriculum incubator is an organizational change strategy that nurtures innovative instructional design and educational improvement. Based on a model for business development, the curriculum incubator offers a protected environment, a temporal space, in which faculty can experiment with new approaches to teaching and learning. Curricular alternatives are tested and refined in an environment free from challenges, criticism, or ridicule. Faculty are encouraged to work collaboratively bouncing ideas off one another in ways that support dialogue about teaching and learning. Incubated courses and programs are piloted and student outcomes documented on a small scale outside the official curriculum.

The purpose of curriculum incubation is to create an environment free from situational influences and organizational realities known to impede innovation and change. Within the incubator, faculty test and refine ideas over time in a cyclic research and development process structured to minimize early resistance to change and demonstrate practices that work. The incubator relies on voluntary participation at all levels. Faculty who wish to participate opt in to the incubator by proposing to explore a novel approach to instructional design. Students volunteer to participate by enrolling in an experimental course or program. Departments review proposed experimental curriculum, support faculty participation, and allow students to exchange enrollment in experimental sections with credit for a similar course in the official curriculum.

Because the concept of curriculum incubation is a relatively recent outgrowth of educational improvement initiatives, the model is still evolving. Little research exists on incubator effectiveness at producing organizational change, innovative instructional design, or sustained educational improvement. Data for this study was gathered over a period of 4.5 months during the second half of the first year of the curriculum incubator. This study relied on interviews and a survey to examine incubator characteristics and effectiveness from the perspective of participating faculty. There were two research questions: What are the key characteristics of the curriculum incubator? What evidence exists of the potential for longer-term incubator effectiveness?

## **Literature Review**

Over the last 20 years, educational research has generated a significant body of literature about the effectiveness of various teaching practices and instructional designs.<sup>1</sup> Both the number and variety of available teaching practices and instructional designs have increased along with empirical evidence documenting successful outcomes from their use.<sup>1,2</sup> In spite of all the documented practices and evidence in favor of effectiveness, one obstacle remains. Factors embedded in each unique combination of discipline, content, students, and instructor challenge the effective application of curricular alternatives across different situations and environments. Instructional design that may be effective in one situation may not be all effective in another.<sup>3,4</sup> Recognition of this challenge is inherent in the proliferation of the faculty development movement which is central to nearly every institutional effort for educational improvement.<sup>4</sup> The way faculty development initiatives traditionally address curricular change and educational improvement is to offer instructional support through educational measures such as workshops, faculty learning communities, conferences, and colloquium.

Although concentrated emphasis on faculty development programs has yielded some useful guidance, research has consistently shown that most faculty development programs are ineffective in creating an environment conducive to curricular change and long-term educational improvement.<sup>6,7,8,9</sup> After learning about alternative instructional designs, faculty need opportunity to explore and adapt curriculum in ways that are appropriate and effective. Research and practice confirm that such a broad approach is needed.<sup>10</sup>

The curriculum incubator was developed as a protected space and time for faculty to explore and adapt approaches to teaching and learning. Because the concept of curriculum incubation is new there is little research or theory to guide development of the incubator or anticipate its effectiveness. Since educational improvement is an institutional commitment with outcomes demonstrated over a long period of time, it is important to determine whether the concept of curriculum incubation has merit, the potential to produce innovative instructional designs and long-term educational improvement.

## **Incubation Theory**

The idea of incubation as a protected environment for nurturing change began in the 1950's with the invention of business incubation as a mechanism to attract industry and promote corporate development.<sup>11,12</sup> While scholarly interest in business incubators has resulted in the

proliferation of empirical studies that examine their competitive and operational environment,<sup>13</sup> development of coherent theories to organize constructs and explain incubator processes has been limited.<sup>14, 15</sup> The knowledge that exists on incubation relates to sheltering new business ventures as a strategy to overcome marketplace challenges,<sup>13</sup> threats to viability,<sup>13, 16</sup> accelerate time to market,<sup>17</sup> and support economic development.<sup>16, 18</sup> Business incubation is a form of venture capitalism where entrepreneurs receive opportunity to develop ideas in exchange for ownership rights<sup>17</sup> and receive funding to launch a fledgling company<sup>19</sup> in the expectation that profit levels will supply lucrative returns guaranteeing long term viability of the enterprise.<sup>17</sup>

The concept of incubation as a way to shelter ideas or manage organizational realities that impede change is relatively new. Maital, Ravid, Seshadri, & Dumanis<sup>19</sup> were among the first researchers to conceptualize incubation in this broad way. Their grounded theory proposed that the developmental paths of emerging businesses are tempered by factors in the environment. Three principles conceptualized business incubation as developmental processes for change: a) incubators which tend to facilitate successful transitions to self-sustaining enterprises shield ideas from forces that threaten viability while simultaneously mimicking the sense of urgency and external pressures that foster independence; b) the most effective incubators are opportunistic and able to successfully assist in the identification and navigation of environmental constraints; c) beneficial incubation processes recognize situational influences in the environment and support alignment to the real world.<sup>19</sup>

The theory of Maital, Ravid, Seshadri, & Dumanis<sup>19</sup> is important because incubation is conceived broadly as an organizational change strategy, a way to develop ideas by managing situational influences and organizational realities known to impede change. The research of Maital, Ravid, Seshadri, & Dumanis<sup>19</sup> characterized incubation as a way to nurture ideas, and not just any ideas, but creative ideas that change the status quo, especially in situations and environments that do not easily accommodate innovation.<sup>19</sup> What remained unknown in incubation theory was to identify characteristics in the environment that support the development of new ideas. What exactly are the situational influences and organizational realities that support innovation in organizations?

## **Creativity**

Research and theory on creativity identify situational influences and organizational realities that support innovation in organizations.<sup>20</sup> Looking at incubation from the vantage of creativity theory alters the application of incubation from a purely market driven endeavor to one with the capacity to define the organizational dimensions of innovation. Creativity researchers have defined a common core of assumptions about situational influences and organizational realities that support innovation in an organization. Playing off of the thinking and discovery of each other, creativity scholars frequently differ only in regard to categorical perspective and application of terminology.

In 1967 Sapolsky, found that discovery of non-technological innovations increased with decentralization of decision making, diversity of rewards and task structures, but the actual adoption of innovations decreased.<sup>21</sup> In their 1977 review of research on the topic of innovation,

Pierce and Delbecq argued that a combination of organizational attributes and member attitudes increased innovation.<sup>22</sup> Situational factors that emerged at the juncture of attributes and membership included constructive conflict and cross fertilization of ideas to stimulate innovation. Cummings and O'Connell postulated that innovation was an opportunistic response to environmental variables such as participative management and worker autonomy.<sup>23</sup> In 1989 Kay<sup>24</sup> theorized connections between values, beliefs and assumptions in the environments of organizations that guide behavior. Amabile later expanded on the idea identifying open communication as a guiding value while high organizational conformity impeded creativity.<sup>25, 26</sup> Amabile developed a model which identified dimensions in the environment that supported innovation. Those dimensions included organizational encouragement, supervisory encouragement, organizational barriers, challenging work, supportive work group.<sup>27</sup> By 1999 Ekvall & Ryhammar had postulated conditions common to innovative environments and refined an instrument to measure their presence.<sup>28</sup> The work of Ekvall & Ryhammar is particularly relevant to the current study since initial research was conducted at a university.<sup>28</sup>

Ekvall's research on situational influences and organizational realities supportive of innovation dates back to the 1950's and includes detailed studies of dimensions in the environment which appeared to support innovation. The dimensions studied by Ekvall were rooted in individual perceptions that when aggregated became a shared psychology influencing the way an organization functioned.<sup>29</sup> Individual perceptions of the presence of nine organizational characteristics became the focus of a 50-item instrument. Researchers argued that the instrument could predict the potential of an organization to innovate.<sup>28, 29, 30, 31, 32, 33</sup>

Developed and refined over more than 20 years, Ekvall's instrument has been the subject of long-term analysis and reliability testing including multiple large-scale organizational studies and factor analysis.<sup>28, 29, 31, 32, 33</sup> The 9 dimensions identified by Ekvall and others are listed below along with their operational definitions:

**Challenge.** A high challenge environment is one in which people experience emotional involvement, joy and meaningfulness in their work to the degree that time and energy are invested in accomplishing tasks.

**Freedom.** High levels of freedom allow people to act independently, take initiative and make decisions.

**Idea Support.** Environments with high levels of idea support are characterized by constructive and positive reception of new ideas. Suggestions are positively received and considered. People listen to each other and find ways to try new things.

**Trust/Openness.** Organizations high in trust foster cooperation along with sharing of ideas and opinions. There is no fear of reprisal in the face of failure.

**Dynamism/Liveliness.** High levels of dynamism foster stirring and eventful activities. There is steady alteration in ways of thinking and acting.

Playfulness/Humor. Spontaneity and ease characterize the organization when playfulness/humor is high. A non-stressful atmosphere pervades.

Debate. Many voices in the organization put forward ideas and many viewpoints are expressed. Diversity of knowledge and experience is considered beneficial to the organization.

Conflict. Tension runs high in an organization characterized by conflict. People dislike each other and political intrigue runs rampant. High levels of conflict are a negative factor for the institution.

Risk-taking. Experimentation is preferred to detailed analysis. Uncertainty is tolerated and the organization pounces on opportunity when it arises.

Idea Time. Organizations high in idea time provide opportunities to discuss and test fresh ideas. Discussions can be impulsive and do not have to be part of an assigned task.

The theory that has developed over time based on Ekvall's work is that situational influences and organizational realities can either nourish innovation or deter it.<sup>34</sup> Consequently, if policies and procedures that nourish and provide opportunity for innovation are intentionally put into place, then innovation should result.

## Methods

This analytical study used a mixed methods design<sup>35</sup> including interviews and a questionnaire to examine characteristics and effectiveness of the curriculum incubator. The focus of the study was to identify and measure faculty perceptions about incubator functioning using Ekvall's<sup>30</sup> nine dimensions of an innovative organization. Then, the aggregated level of the presence of these 9 dimensions could be compared to levels Ekvall<sup>30</sup> found in organizations with a history of innovation and, alternatively, in organizations with a history of stagnation. High levels of Ekvall's 9-dimensions would indicate that the curriculum incubator had the potential to create an environment conducive to innovative instructional design and educational improvement. High levels of Ekvall's nine dimensions would argue in favor of the potential for longer-term incubator effectiveness.

The setting for the study was a highly ranked College of Engineering in a large Midwestern Research University. Interviews were conducted with a purposive sample of faculty and incubator leadership. The sample represented 43.9% (n=18) of participants and 45.45% (n=10) of college departments. Sampling procedures involved sitting down with an incubator Co-Director and discussing the organizational structure and variety of faculty participation. It was clear from listening to the Co-Director that faculty perspectives varied widely depending upon the focus of participation and level of activity. Participants in the incubator came from 10 departments within the College of Engineering and 12 departments across campus with engineering multi-disciplinary or cross-disciplinary ties.

Participation in the incubator fell into a 3-tier hierarchy: (a) a central core of faculty were involved with incubator development and daily operations; (b) a second group taught or worked directly with incubated courses and programs; (c) a third group of faculty provided moral support and expert guidance but were not routinely involved with incubator activities. This hierarchy became the sampling frame for selecting potential candidates for interviews. Six candidates in each of the three tiers were nominated for interviews by the co-director. This sampling strategy insured maximal variation in the data; the entire range of perspectives found within the incubator would be considered. The sample represented 43.9% (n=18) of participants and 45.45% (n=10) of college departments.

Fifteen semi-structured interviews were ultimately conducted. This represented 83% of the sample and 39% of the total population. All six of the Tier 1 faculty were interviewed including two non-teaching engineering administrators; two engineers who shared teaching and administrative duties, one engineering faculty and one faculty member from a discipline outside of engineering. Five of the six Tier 2 faculty gave interviews. These included two engineering faculty, two engineering deans, and one faculty with joint appointments in engineering and another discipline. Four of the six Tier 3 faculty were interviewed including two engineering faculty and two faculty from other departments with ties to engineering.

Two interview protocols reflected the nature and level of participation in the incubator, but it became apparent almost immediately that knowledge of the incubator was bounded by the duration of association, specific circumstances, and intensity of participation.<sup>36</sup> For this reason interviews varied widely lasting as few as 44 minutes to 1 hour and 15 minutes. All of the interviews were audio recorded and transcribed. Identifying information was removed; the transcription was dated, and a code assigned. The transcription code identified the tier and an interview sequence number. An excel file served as the interview code key. The code key remained the only identifying link between interviewee and interview data.

Interviews were analyzed using the constant comparative method to determine major themes.<sup>37, 38, 39</sup> Analysis of interview transcripts was conducted prior to surveying faculty in order to determine if there was a basis for the assumption that faculty would characterize situational influences and organizational realities in terms applicable to Ekvall's theory.<sup>30</sup> In order to determine any similarity to Ekvall's dimensions of innovation, multiple readings of interview transcripts were used and comments descriptive of incubator characteristics were identified. Then, these descriptive comments were compared to the operational definitions of Ekvall's 9 dimensions of an innovative organization in order to determine similarity. Once it was determined that faculty did perceive incubator characteristics in terms that were comparable to Ekvall's dimensions, a questionnaire was used to measure the strength of those characteristics among all faculty participating in the incubator.

All thirty-eight faculty affiliated with the curriculum incubator were potential respondents for the questionnaire. Incubator faculty represented 22 disciplines within the College of Engineering and across campus. Twenty-five of the thirty-eight incubator faculty (66%) were affiliated with departments within the College of Engineering and thirteen faculty had cross-

disciplinary relationships with engineering. Cross-disciplinary relationships included direct or indirect research or teaching affiliations with engineering as a major focus.

Items for the survey were developed from published research on the 9-dimensions of an innovative organization and a subsequent instrument, the Situational Outlook Questionnaire (SOQ).<sup>28, 29, 31, 32, 33</sup> Since the SOQ is restricted to commercial use by registered consultants who pay for the privilege, the actual SOQ was not used in this project. However, because the SOQ and its predecessor the Creative Climate Questionnaire (CCQ) have been widely tested and studied over many years, a substantial body of literature documents their use, reliability, and utility. Survey items for this study were developed using modified wording from sample SOQ items in published research and reports as well as the published operational definitions for each dimension. As with the SOQ, Likert style items asked respondents to rate statements according to their applicability or importance on a 4-point scale. Each statement related directly to one of the 9 dimensions identified by Ekvall as important for an innovative organization.

Draft questionnaires were subjected to two forms of pretesting: expert review and cognitive interviews. Multiple methods of review were considered important to increasing the likelihood of a high quality instrument.<sup>40</sup> Expert review is a process where seasoned professionals in survey research review and comment on the instrument.<sup>40</sup> Expert review has been found to be effective at finding potential problems, particularly problems that might affect data analysis.<sup>41</sup> In this study, the purpose of expert review was to ensure item clarity; that respondents would interpret items as intended. Two experts, one from survey research and one from engineering and human behavior commented on item wording, noted potentially confusing terminology, and estimated the time needed to complete the questionnaire. Potential problems were corrected and the new draft was subjected to five cognitive interviews.

Cognitive interviews are the most common form of pretesting for survey research.<sup>42</sup> Research has shown that cognitive interviews accurately and consistently identify potential problems with questionnaires.<sup>43</sup> Five educators from the fields of faculty development, survey research, statistics, engineering, and evaluation participated in cognitive interviews. During cognitive interviews respondents were asked to complete the questionnaire while thinking out loud about the choices they would need to make in order to respond; how they would decide their response; items that were difficult to understand; and possible alternate interpretations of items. Cognitive interviews were audio recorded. Both recordings and notes were used as references to modify items. Cognitive interviews were helpful in refining the meaning and intent of items, making them simple, straightforward, clear and readable. Additional revisions were made in the instrument and it was tested for the last time on an incubator participant who was then removed from the respondent pool. The final version of the questionnaire developed for this study used 36 items, four items for each of the 9 dimensions. As a result of pretesting mentioned above only one major adjustment to the questionnaire was made.

In the SOQ, 8 of the 9 dimensions are positively correlated to an innovative organization; one dimension, the Conflict dimension, was negatively correlated. In other words, less conflict enhanced creativity and innovativeness.<sup>31</sup> The Conflict dimension tested by Ekvall,<sup>31, 44</sup> Isaksen, Lauer, & Ekvall,<sup>32</sup> Isaksen, Lauer, Ekvall, & Britz,<sup>29</sup> and Isaksen,<sup>33</sup> focused on



issues of ego, personal opposition, and turf wars. Items related to Conflict in the SOQ asked respondents to identify areas of tension, negative use of power including the presence of personal enmity, hostility, and emotional discord. In answering the items respondents had to think about high conflict situations; groups and individuals they might dislike. The dimension of conflict sought to identify the presence of interpersonal warfare, plots, traps, power, and territorial struggles, personal differences, gossip and slander that may have been part of organizational life. Low Conflict situations, in which members behaved with emotional maturity, used psychological insight and control of impulses increased the potential for innovation.<sup>29</sup>

During development of the questionnaire, wording of items in the Conflict dimension proved awkward and the issues addressed seemed inappropriate, antithetic to both incubator participants and the general incubator environment. Item pretesting consistently bore out the potential for destructive and detrimental effects from these items. As a result, Conflict was reconfigured as a positive dimension. A new operational definition was defined, and the dimension was renamed Emotional Maturity.<sup>1</sup> There were a couple of reasons this change seemed to improve the questionnaire. First, the dimension became a positive factor; a high score was indicative of an innovative organization. This was consistent with the other 8 dimensions and more in keeping with the positive orientation of the instrument. High mean scores in all items would consistently identify an organization with the potential for innovation; low mean scores would indicate organizational stagnation. Second, re-orienting Conflict items to a positive focus immediately made items user friendly, less threatening to a small group of respondents, more likely to be answered, and more palatable to participants generally.

This study claims theoretical support for survey items based on the history and research of the SOQ,<sup>45</sup> but because the survey is not the same as the original instrument, reliability testing was important to credibility. Using SPSS, three reliability tests were conducted to verify the overall scale and subscale internal consistency for the questionnaire: (a) Each item was tested against the sum of all items; (b) Groups of 4 items in a subscale measuring each dimension of the SOQ were tested against each other; (c) Finally, each group of 4 items in the subscales measuring one dimension was tested against the sum of all items. Reliability testing using Cronback's Alpha revealed acceptable (.70 and higher) or good (.80) inter-item correlations.<sup>46</sup>

When each item was tested against the sum of all items, alpha coefficient indicated acceptable internal consistency at .734. Overall, the scale was approximately 73% reliable at measuring the intended constructs. It should be noted that lack of variability in the responses to one item caused SPSS to exclude it. Groups of four items measuring one dimension were tested against other groups of 4 items. This yielded a Cronbach's Alpha of .814 indicating that each group of 4 items was a relatively cohesive measurement of the same dimension. Lastly, groups of 4 items were tested against the sum of all items to determine if each group of four contributed equally to the scale. This test yielded a Cronbach's Alpha of .757.

The survey, which targeted all participating faculty, had an acceptable rate of return (61%; n=23). Sixteen (70%) of the 23 faculty who returned questionnaires were affiliated with engineering disciplines and seven represented other departments or organizations on campus. Respondents indicated the level of agreement with items on a 4-point scale from weak (1) to

strong (4). Eighteen items in section one asked faculty to rate the applicability of 9 dimensions of innovation to the curriculum incubator. Nine items in section 2 asked faculty to rate the importance of 9 dimensions of innovation to incubator activities. Section three asked faculty to rate the evidence that dimensions of innovation influenced incubator activities. Data was analyzed in 4 stages. Each section was analyzed separately, and then all three sections were aggregated for a final analysis.

Procedures for analysis included first recording individual responses to each item on a spread sheet. Then, spread sheet data was loaded into SPSS. The SPSS software was used to calculate descriptive statistics for single items, then the group of items within each section of the questionnaire. Finally, descriptive statistics were calculated for the aggregated data. The resulting mean scores identified the magnitude of the presence for each of the 9 dimensions in Ekvall's theory. Finally, an Analysis of Variance (One-way ANOVA) was run for each section and for the sections combined to test for significant differences in means among sub-groups in the population. Comparisons were made between subgroups of engineers, non-engineers, and the governing advisory group. Although the underlying assumptions for using ANOVA were met, the sample size was small and the findings were not robust. As a result only aggregated data was considered meaningful. Mean responses were plotted on a spider chart indicating graphically faculty perceptions of the presence of Ekvall's nine dimensions in the curriculum incubator. Finally, mean responses for incubator participants were plotted on a spider chart along with mean responses for organizations with a history of innovation and responses for organizations with a history of stagnation.

## **Results**

Other research has shown with a high degree of certainty a strong relationship between the ability of an organization to implement new ideas and the perceptions of organizational members of the presence of certain organizational characteristics that promote innovation. The curriculum incubator revealed these characteristics in a curricular change process that challenged traditional planned change models of curricular change.

### ***What are the key characteristics of the curriculum incubator?***

Key characteristics of the curriculum incubator were identified in a two stage process first using qualitative data from interviews then using a survey to determine the strength of their presence among faculty. Interview data resulted in the identification of 24 themes perceived by faculty as characteristic of the curriculum incubator. Figure 1 below lists characteristics of the curriculum incubator identified in interviews.

Using operational definitions of Ekvall's<sup>30</sup> nine dimensions of innovation it was possible to compare characteristics generated by interviews to dimensions of innovation and determine that some relationship likely existed. But, it was not possible to determine the strength of perceptions relating to dimensions of innovation or if any of the characteristics would be considered more applicable to the incubator than others without looking at data from the questionnaire.

Table 1, below, identifies each of the 9 dimensions of innovation and indicates the mean level of their perceived rating in the incubator. Mean ratings are noted along with a short

Collaboration & Cooperation	Permeable Boundaries
Voluntary Participation	Safe Supportive Environment
Respect for Faculty Governance	Experimentation & Evaluation
Administrative & Departmental Support	Entrepreneurial
Student Involvement	Multiple & Diverse Perspectives
Strategic Partnerships	Exploration & Risk-taking
Transparent & Inclusive Processes	Inspiring
Leverage Research & Existing Knowledge	High energy
Climate of Trust	Humanistic
Conversations & Debate	Chaotic
Adaptive & Opportunistic Responses	Interdisciplinary
Cross Pollination of Ideas	Thoughtful, reflective

*Figure 1* Incubator attributes based on qualitative analysis of interviews (N=24)

definition of the characteristic and the standard deviation. When these scores are plotted on a spider chart to illustrate relative magnitude, a picture begins to emerge of an organization where members believe innovation is possible. (See Figure 2 below)

Data from the questionnaire indicated that participating faculty perceived high levels of all nine dimensions of innovation in the incubator. Ratings ranged from a mean of 3.70/4.0 for Idea Support to 3.33/4.0 for Trust & Openness. The fact that Idea Support resonated most with incubator faculty is no surprise. Idea Support is defined as openness to new ideas; exploration of new ideas; diversity of perspectives. In interviews faculty generally recognized the value of support for innovative instructional design and educational improvement at all levels of the organization. Faculty had great faith in the talents and abilities of their colleagues to discover innovative new ways to approach teaching and learning if they were given the opportunity.

That's why I always from day one I was convinced that the curriculum incubator had a future in this college. Given the creativity of my colleagues in this college; I was very optimistic about the fact that once we established [the environment] it would develop a

life of its own and different ideas and different opinions would mature to something much more – even much more creative than what we originally had in mind.

*Table 1*  
*Ranked Perceptions of Aggregated Data Ratings on Incubator Attributes (Scale 1-4), (p < .05)*

<b>Ekvall (1996)/ Isaksen (2007) Dimensions</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>IDEA SUPPORT</b>		
Openness to new ideas; exploration Of new ideas; diversity of perspectives	3.70	.30
<b>IDEA TIME</b>		
Opportunity to explore and develop new ideas; atmosphere of flexibility	3.68	.48
<b>CHALLENGE/INVOLVEMENT</b>		
Intrinsic motivation, commitment, joy, & meaningfulness	3.67	.48
<b>EMOTIONAL MATURITY</b>		
Psychological insight; emotional maturity	3.62	.50
<b>PLAYFULNESS/HUMOR</b>		
Atmosphere of spontaneity, light-heartedness	3.60	.50
<b>RISK-TAKING</b>		
Tolerance of uncertainty, ambiguity; willingness to gamble on new ideas	3.55	.51
<b>FREEDOM</b>		
Individual freedom to pursue interests	3.52	.68
<b>DEBATE</b>		
Sharing different experiences and knowledge	3.45	.67
<b>TRUST/OPENNESS</b>		
Trust, mutual respect & support	3.33	.80

*(p < .05)*

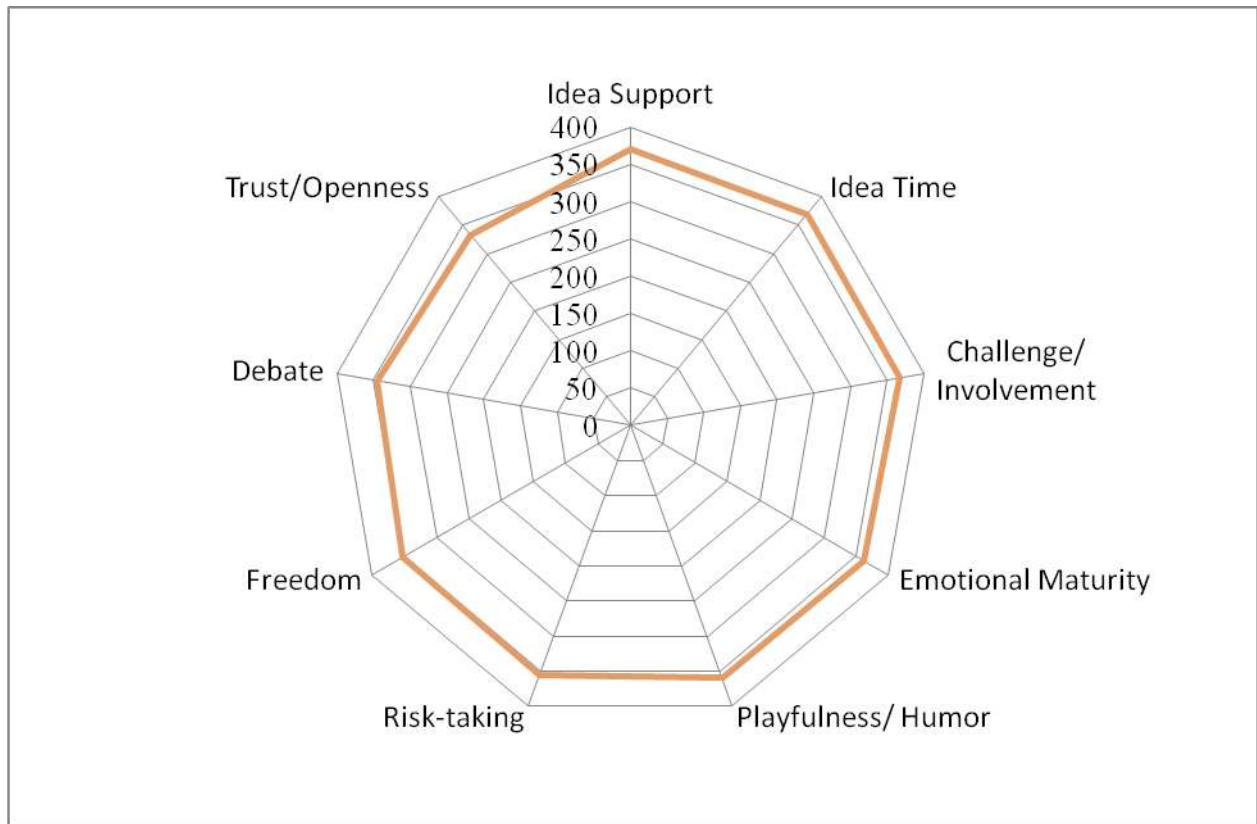


Figure 2 Aggregated Means for Nine Dimensions of Innovation

***What evidence exists of the potential for longer-term incubator effectiveness?***

Evidence in support of the long-term potential effectiveness of the curriculum incubator was addressed by plotting the aggregated mean ratings for each dimension of innovation on a spider chart and comparing the means to other organizations studied by Ekvall.<sup>30, 31</sup> The aggregated data indicated a strong presence of 9 characteristics relating to the dimensions of innovation in the curriculum incubator environment. The relative strength of faculty perceptions seemed to indicate that faculty perceived the incubator as having the potential to produce innovative instructional design and sustainable instructional improvement. Research shows that perceptions are powerful indicators for organizational change and, more importantly, strong perceptions that change is possible indicate the potential for sustainable change.<sup>33</sup> Since mean ratings of faculty perceptions indicated a strong presence of characteristics supportive of innovation, the next step was to determine if the magnitude of their presence compared favorably to other organizations with a demonstrated capacity for innovation.

Examples of scoring for other organizations were available from the work of Ekvall and others.<sup>29, 47</sup> As a result of his work with organizations, Ekvall<sup>47</sup> calculated aggregate means along dimensions for innovation that were parallel to the research conducted on the curriculum

incubator. For his studies Ekvall used 10 organizations with a long-term track record of innovation and compared them to 5 organizations with a long-term record of stagnation.

For his study Ekvall<sup>47</sup> sorted companies based on criteria established by Nystrom & Edvardsson.<sup>48</sup> The following criteria were used: Innovative organizations invested in new products that increased the probability for their longer term survival. Stagnated organizations were unsuccessful in creating new products and experienced difficulties in their markets that marginalized their longer term viability.<sup>48</sup> Once organizations were sorted, the aggregated means of each type of organization were compared. In order to compare Ekvall's findings with the results of current research several hurdles needed to be overcome. The process for overcoming each of these hurdles is discussed below.

Three differences between the studies in the 1980's and the current project complicated the comparison of these data sets. The primary difference between those earlier studies and the current study is that Ekvall's 1986 research used the Creative Climate Questionnaire (CCQ). The CCQ was an earlier instrument developed by Ekvall<sup>49</sup> used to analyze organizations along 10 dimensions of organizational creativity. Later research by Ekvall and others replicated the earlier research but used only 9 dimensions of organizational creativity. The reason that later studies used only 9 dimensions is that research subsequent to Ekvall's 1983 and 1986 studies<sup>47, 49</sup> indicated that issues of reliability and content validity justified a reduction from 10 to 9 items.<sup>50</sup> Based on Lauer's (1994) work,<sup>50</sup> a dimension, called dynamism, was omitted from the instrument and the newer instrument was named the Situational Outlook Questionnaire (SOQ). Both instruments have been reported to perform similarly and with consistent validity and reliability.<sup>29</sup> The CCQ and the revised and updated SOQ provided the conceptual foundation for this study. For purposes of comparison in this study, the 1986 data is presented with the dimension of dynamism omitted.

Another difference between the earlier studies of organizations and the current research on the curriculum incubator involves the calculations Ekvall used to map the data from organizations. Although Ekvall's original studies and the current research both used 4-point Likert-style scales to assess dimensions of innovation, Ekvall's scoring range was 0 to 3. As part of his data mapping protocol Ekvall's aggregated means were multiplied by 100 creating a score with a theoretical range of 0-300. Comparisons of scores involved mapping two sets of scores on a spider chart to compare the pattern differential between types of organizations.

The 4-point Likert-style scale used for this project ranged from 1-4. In order to overlay the results of Ekvall's research on the findings for the curriculum incubator the original 1986 scores were converted to a range of 100-400 by adding 100 points to each score. Then the aggregated averages for the curriculum incubator were converted to Ekvall's scale by multiplying the aggregated mean by 100. This process converted all scores to a defined range of 100-400. This scoring profile created a single scale allowing for comparisons across Ekvall's original study and the current research.

The third issue with comparison of data between 1986 and the present involves the dimension of Emotional Maturity. Both the CCQ and SOQ utilized a dimension called Conflict.

A low score on that dimension was a positive indication of an organization exhibiting high dimensions of innovation. In the current study, the dimension of Conflict was redefined as Emotional Maturity to positively correlate with innovation. A high score would be indicative of an innovative organization. In order to make the aggregate score for conflict from the 1983 study comparable to the definition for Emotional Maturity used in the current research, a process was used to convert the score. The 1983 aggregated score for conflict in the 10 innovative organizations was 78. That score was converted to a positive score for emotional maturity by subtracting 78 from 300, the upper limit of Ekvall's score range. That difference is 222. Then, to convert the aggregated mean to a score ranging from 0-300 to a score ranging from 1-400, 100 points were added. The final score for Emotional Maturity based on Ekvall's (1983) research is 322. The same process was followed for aggregated data from the Conflict dimension of the group of stagnated organizations. The original aggregated data from Ekvall's (1986) study of organizational types is shown in Table 2 below.

Table 2 *Ekvall's CCQ Data Comparing Innovative and Stagnant Organizations\**

Dimension	Innovative Organizations (n=10)			Stagnated Organizations (n=5)		
	M	SD	Range	M	SD	Range
Challenge/Involvement	238	27	219-300	163	10	154-176
Freedom	210	19	185-240	153	32	114-192
Trust/Openness	178	36	90-212	128	29	89-168
Idea Time	148	13	123-168	97	53	70-130
Playfulness/Humor	230	31	148-260	140	21	105-158
Emotional Maturity**	322	31	344-250	260	14	274-238
Idea Support	183	14	166-200	108	23	80-132
Conversation/Debate	158	31	110-204	105	6	98-112
Risk-taking	195	27	153-240	53	15	34-70

\*From Isaksen, S. G., Lauer, K. J., Ekvall, G., & Britz, A. (2001). Perceptions of the best and worst climates for creativity: Preliminary validation evidence for the Situational Outlook Questionnaire. *Creativity Research Journal*, 13(2), 171-184, p. 178.

\*\*Recalibrated from Conflict

Figure 3 below compares the mean scores for the curriculum incubator to mean scores for Ekvall's 10 innovative organizations and 5 stagnant organizations. The relative strength of faculty perceptions in this study compared favorably to earlier studies and appeared consistent with an organizational environment ready to innovate and willing to make changes.

Organizations that exhibit high scores on dimensions of innovation have been shown to demonstrate an ability to support change, innovation, and creative problem solving<sup>33</sup> (Isaksen, 2007). The resulting comparisons provide evidence that incubator activities are capable of

establishing an environment conducive to sustained curricular change. Using an incubator as a change mechanism, one that creates a protected time and space for curricular research and experimentation, has the potential to encourage durable and sustainable curricular change.

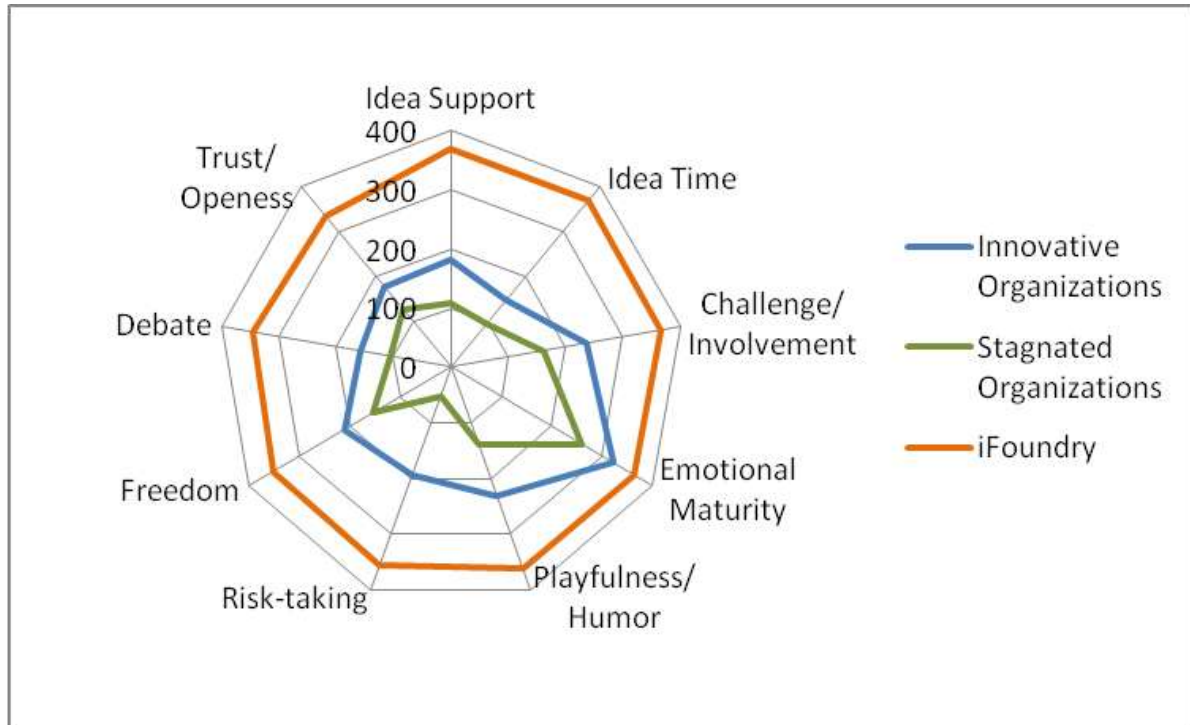


Figure 3 Comparative scores on 9-dimensions of innovation among organizational types

### Conclusions & Wider Significance

Curricular change efforts often fail because even after prolonged effort, people revert to old practices. The salient characteristic of the curriculum incubator was the ability to nurture a temporal space and psychological environment in which organizational members were ready, willing, and able to create and sustain change.

The wider significance of this study is for leadership. Incubator leadership created an insulated environment, opportunities to test and to document results. Such environments do not happen without the guided intent of leadership. Within the secure environment of the curriculum incubator, individuals had the time and the opportunity to chart their own course, to do what felt right at the most elemental level, and to adapt to change in a way that fulfilled their needs, made sense, and moved the organization forward.



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## Endnotes

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<sup>1</sup> Emotional Maturity. The organization is characterized by emotional safety and low conflict. High trust and openness supplant suspicion and cautiousness. People like each other and work together well. There is little political intrigue. Members rely on psychological insight and manage emotional responses rather than create conflict.