

Confidence! Its Role in the Creative Teaching and Learning of Design and Technology

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Educational context

There is a well-established link generally between achievement and self-confidence in creative teaching and learning which good teachers both recognize and attempt to promote. Kimbell et al. (1991) found that confidence is an important contributor to success in design and technology. In Fryer's (1996) research, which involved 1028 teachers and lecturers, concluded:

Just about all the staff said that they thought that building children's confidence was crucial to the development of creativity. There can also be a self-fulfilling prophecy effect according to a social work lecturer: 'if you tell people they are creative, they are more likely to be creative.' (p. 82)

In the United Kingdom, over recent years since the implementation of the Technology Order as a component of the 1988 Education Reform Act (Department for Education, 1990), the role of Government has been central in determining what is taught through the National Curriculum. It has also indirectly been in control of how teaching takes place through the regular inspection procedures by the inspection agency, OFSTED (Office for Standards in Education). This affects all state schools and all teachers. Ownership of teaching processes has in part been taken away from schools and teachers who are anxious to ensure that their schools and teaching are seen in best light. There is a competitive culture where parents and students strive to gain entry to the "best schools" on the basis of the information available, which includes tables of standardized assessment results and publicly available inspection reports on each school. Kimbell (1997) discussed in detail how the unraveling of the National Curriculum assessment structures disempowered design and technology teachers by not supporting a holistic approach to teaching and assessing the subject. It created a cumbersome bureaucracy while producing less trustworthy information than before. This is particularly disturbing for design and technology for which the heart of the matter is often thought to be creative thinking and problem solving. Among teachers, there is a widely recognized difficulty of balancing the teaching of "skills" and promotion of creative

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responses from learners. Kimbell (1996), writing about the role of the government in design and technology classrooms, feels that:

...the centralizing influence of a national curriculum runs the risk of placing a dead weight on innovation—discouraging imaginative teachers and schools from developing their curricula. (p. 99)

The problem has been recognized by the Secretaries of State for Education and Culture, Media and Sport, the Rt. Hon. David Blunkett, MP, and the Rt. Hon. Chris Smith, MP, who set up the National Advisory Committee on Creative and Cultural Education (NACCCE) in February 1998. Its terms of reference were that the Committee should take stock of the current provision for creative and cultural education in formal and non-formal education, including that for design and technology, and to make proposals for principles, policies, and practice. In his forward letter in the report (Department for Education and Employment, 1999), the Rt. Hon. David Blunkett, MP, begins, “Creative and cultural education can help raise educational standards by boosting a child’s confidence and self-esteem.”

Research Methodology

The philosophical basis for this research is phenomenological in the sense that it was intended to examine creativity as a phenomenon construed by teachers and learners in the context of design and technology. Phenomenology is described by Polkinghorne (1989) and Husserl (1931) as having its origins in “an exploration of the structures of consciousness in human experiences.” Cresswell (1998) applied it more recently and extensively to a full spectrum of human sciences for research and development purposes. The findings concerning the contribution that confidence makes to creative teaching and learning in design and technology education are explained and then considered in the light of what is contained in literature.

The research was designed to reveal relevant constructs (personally constructed meanings) based on the experiences of students and teachers and their understanding as determined through discussion and clarification. The methodology involved using semi-structured interviews with teachers and learners in ways which enabled them to recount in detail their experience of a phenomenon like creativity, for example. They were designed to give maximum opportunity for respondents to be reflective about their experiences of creativity resulting in responses that made explicit their values, interpretations, and judgements. Phenomenology is concerned with the “science of essential being” dealing with “essences,” not “facts” relating to the individual constructs around which individuals build their worlds.

An independent secondary school for girls was selected to host the research. The decision was based on the design and technology department prioritizing the phenomenon (creativity) and the school was eager to use the research for self-development. The results used in this paper were derived from recorded, semi-structured interviews with three teachers fictitiously named Sheila, Helen, and Ray. These teachers had major interests in textiles, food, and resistant

materials respectively. Six students were also involved with the fictitious names of Ann, Brenda, Carey, Dianne, Ewan, and Fay.

In order to access the private worlds of respondents, a research technique was derived from Personal Construct Psychology (PCP). Central to the meaning of PCP is the notion that we all construe our worlds and approach new problems in ways that reflect our experiences (Kelly, 1955). Each teacher selected up to six products that students had designed and made which they as teachers found interesting in some respect. The “link” between interesting and creative was made during subsequent interviews when these products were used as elements to build repertory grids (see Pope & Denicolo, 1993; Yorke, 1978). Each grid consisted of a map, graphically presented, of each respondent’s constructs that were derived and recorded through a close examination of the elements. The constructs (personally constructed meanings) of each respondent about their experience of teaching, related to the circumstances of the learning resulting in the products, were explored. The grids were constructed during each interview for which transcriptions were subsequently analysed. This involved identifying a construct with the teacher that was thought to be important in relation to all of the products. For example, Helen decided that students took risks with their products. An emergent pole and a contrast pole were then identified, forming the two ends of a continuum for measuring the construct. The emergent pole in this case was determined to be “high risk-taking” and the contrast pole considered to be “low risk-taking”; high risk was graded as 1, low risk as 5. Two products were identified that were similar with regard to the level of student risk-taking and one that was completely different in accordance with a particular construct. Subsequently, all products were graded by Helen on a previously agreed scale of 1-5 as to the perceived level of risk-taking associated with each product. Interviews with two or three students, whose work was considered in each teacher interview, were then conducted along simplified, but similar lines. They each brought the selected piece from the teacher interview and five further products manufactured at school or at home. With students, the approach was adapted from a methodology developed by Salmon and Hilary (1984), and was specifically developed for use with children. Their study involved Year 8 learners in design and technology classrooms and involved using a simpler grading procedure.

The method enabled teachers and subsequently students to discuss their constructs freely. Evidence of the assumptions and principles that were behind their judgements were sought and recorded. A great strength of the method was that this particular style of interviewing helped respondents to clarify their ideas through bringing to the surface buried knowledge, feelings, and beliefs.

Data Analysis

Repertory grid data were analyzed using REPGRID software, which allows the responses of each teacher and student to be numerically and graphically analyzed to show patterns and relationships in the constructs that each holds. Interviews were transcribed and coded in detail using NUD*IST 4 qualitative analysis software. The efficient sorting and searching facilities of this software allows patterns in constructs within and across data-sets to be found and theories

to be built and tested. The phenomenological tradition for data analysis was followed. This involved a gradual reduction of the data into clusters of common constructs and eventually identifying the essential invariant structures or essences (Moustakis, 1994; Polkinghorne, 1989) which comprised the main common threads of meaning and response. This revealed information about the contribution that creativity made to design and technology for the respondents. Two matrices of construct groups were drawn up as a result of the interview analysis. The constructs related to their “common” perceptions of what was important for creativity in teaching and learning. The matrices indicated the relative frequencies that respondents reported particular strengths and weaknesses in connection with each construct, and compared the responses of teachers and students. The matrices were:

1. The construct group relevant to “creative teaching to support creative learning”:
 - the construction of relationships between teachers and learners,
 - teachers’ personal creativity attributes,
 - teachers’ approach to dealing with knowledge,
 - teachers’ delivery styles.
2. The construct group relevant to “creativity and student learning”:
 - student personality attributes,
 - cognition and creativity,
 - opportunities for creativity,
 - student approach to learning.

The results that follow elaborate on a summary of the evidence distilled from an analysis of the matrices. They indicate the relationships between teacher/learner confidence and the perceived strengths and weaknesses present that enabled creativity to be an important part of teaching and learning. The role of confidence generally is the overarching theme.

Results

Difficulties with promoting creativity in students’ work

All three teachers felt that they were capable of being creative in some aspects of their personal lives and hence felt that they generally understood what being creative meant, even though this understanding differed among the teachers. It was significant that none of the students commented on the creativity of their teachers, hence they did not recognize them as role models or mentors in this respect. All three teachers felt that creativity has a role in the teaching and learning of the subject, but a subservient one to the development of knowledge and skills. They were confident that their knowledge of the subject was good, as was their command of key skills. In practice, they admit that they emphasize the areas of knowledge and skill with which they as individuals are most confident. The teacher’s views were shaped by concerns about:

- their own interpretation of what constitutes creativity;
- their own personal, “self-perceived” levels of creativity;
- wasting time when assessment goals need to be achieved.

The students were negative about the interest and relevance of some of the activities. They did, however, agree with teachers who said they prioritized rigorous critical testing and evaluation, valued originality, and, to a certain extent, encouraged self-expression. There was a strong feeling by the teachers that, in practice, they were unable to support student risk-taking or encourage originality because of the pressures on them to minimize failure of all types, so as to not allow any “performance deficiencies” to be perceived by institutional and public agencies:

Sheila: “. . .it is not always possible to register their levels of originality.”

Helen: “I think a large part of my role is that I have to meet the regulations of the National Curriculum.”

Sheila is prepared to accept that her students might be more creative than she, and is more sensitive than the others to recognizing that she could learn from them. Ray is anxious to promote creativity, but feels that he is not very creative himself. Sheila expressed concerns about teaching screen printing, as did Ray with electronics, based on a lack of personal confidence in these subject areas. As experienced teachers, they are confident working with students, with the exception that Sheila is more anxious than the others about not identifying, and hence supporting, creative student work in an appropriate way. Both Sheila and Helen however, feel that the development of products with function and form that has incorporated imaginative and original design are at the heart of the subject. The difficulty admitted by all three teachers, was that of satisfying their recognized responsibility for teaching processes to classes of students. All three teachers recognize the difficulties of meeting student expectations, the needs of the subject, and subject National Curriculum Order simultaneously.

Risk-taking for teachers

Teachers were not significantly conscious of being risk-takers with their personal design and technology activity, but Sheila and Helen both had histories of risk-taking in their lives that were linked to significant personal and professional development.

The success of the Design and Technology Department at the School is measured mainly through subject selection by students, on entry into public examination courses, at ages 14 and 16, and upon subsequent examination success. Both bring status and confidence for the teachers and the department. These are major influences when the teachers develop curriculum content and pedagogy. As a consequence, teachers are not willing to take any risks that might jeopardize learning and do their best to ensure that all students learn something. This raises the question as to the amount of effort this requires with learners who are not well disposed to learning. The constraints affect the degree to which teachers are prepared to trust students. They all perceive that projects that challenge students are “high risk” to support. They also perceive that students do not naturally choose difficult tasks which can lead to high achieve-

ment, instead, they often make compromise decisions that attempt to maximize success while minimizing effort.

The teachers recognize the risks they take when building relationships with students. Sheila knows that they use her as a scapegoat for any failure. She also feels that dealing with this is an essential part of her role but gives a strong incentive to offer tasks that are secure and tightly constrained:

Sheila: "...I want them to have a go at this and sometimes they don't quite finish. They are disappointed and I find it very difficult to make them feel better about the quality of the work that they have done. I feel I carry a lot of 'blame' for this then."

In contrast, personal rewards are high when she convinces a student to take a risk who subsequently takes ownership of the process. Sheila recognizes that students firstly need to respect her as a person, secondly as a subject specialist, and finally as an examination gatekeeper. In reality, this third factor often predominates. All three teachers take risks when dealing with student value systems through imposing their own, but the pressures of the role limit the opportunity to construct value systems with students.

Reactions of learners; sources of frustration and concern

Some students construe projects as exciting overall but gain limited enjoyment from manufacturing due to fears of working with the equipment, such as drills and saws. This can lead to a loss of interest in the subject overall and is difficult to overcome.

Ann and Fay admit low confidence levels and shy away from high-risk strategies that contain a chance of failure, even though they both recognize that are capable of taking more imaginative approaches to their work. Fay is a bright articulate student who has superficially convinced herself that success in the subject doesn't matter. Dianne understands the relationship between achieving quality results and taking risks with ideas. She is prepared to spend time and effort dealing with complexity and to achieve simple but elegant solutions. Frustrations with her skill levels often cause her disappointment, hence pride and enjoyment is gained from success with simple tasks. Dianne admits difficulties with craft skills, but questions their educational validity.

Ann is discouraged from taking even low level risks with her approach due to perceived restrictive examination and assessment targets.

Ann: "I don't want to get a really bad mark. It is the marks; you don't want to have something that looks really bad."

Her interview evidence indicates that this pressure leads to stifled intuition. Students do not, in general, feel that they are able to deal with the problems of the subject objectively. As a result of their lack of confidence and the nature of the expectations of their performance, emotive reactions often occur. Evidence from interviews showed low perseverance with tasks that are set since the

motivational factors are limited to those linked to performance on examinations and assessments. Students do not see that the activities in which they engage are linked to a growing interest and understanding of the rest of the world around them. As a result, they do not build confidence.

When confidence levels are high, as with Brenda and Carey, they seek to learn from failure. Some rationalize the relationship between learning and failure, but do not feel strong enough to face real challenges that match their potential and ability. They work to satisfy themselves, actively minimizing risk by ignoring the wider perspectives. Some of the greatest risks felt by students relate to satisfy their peers. Carey does not want to lose face or credibility by doing something that others might construe as stupid or of low worth. This can greatly affect performance in group work, as in Ann's case elaborated above. Students such as Brenda can be very intolerant of peers.

The importance of student ownership

Ann and Ewan both construed that teachers value only the outcomes from the activities that they themselves introduced and supported as part of their curriculum experience. They feel that this was a way in which teachers justify their role. All of the teachers agree that there is a limited emphasis on promoting self-directed learning and that the constraints governing their work does not allow this to happen. On the other hand, the teachers believe that they offer good mentorship to students. But this is in contrast to the students' belief who agree additionally that there is little opportunity for self-directed learning, desire it as a priority, and often do not relate to the priorities that teachers set. Students such as Dianne recognize the need for close, individual teacher support, as she articulates the difficulty of getting her ideas out into the world. She knows that she needs the help of teachers to achieve this through identifying what is reasonable to achieve and what is not. When teachers are perceived to be insensitive to this problem, students react in negative ways to them as individuals. There is a strong response from a number of students such as Ewan that good teachers enhance their own feelings of pride about good achievement:

Ewan: "...I spent a lot of time working through my ideas which I thought were quite interesting. I spent a long time thinking about how I would like it, but the teacher didn't seem to think much of it, so I didn't make it as good as maybe I could have made it."

This occurs through recognizing "what is good work for them" as individuals. Fay feels that she produces her best work only if she has the support and endorsement of her teachers. Overpowering, authoritative approaches from teachers are also vehemently rejected.

Teachers are committed to encouraging student self-expression, but linked to students taking a thoughtful approach to their work. There is a measure of agreement between teachers and students that originality is encouraged and supported where possible, which leads to students such as Dianne and Fay being more confident than the others. Teachers and students know the value of skepticism in developing independent approaches to learning, but none felt

confident when dealing with it. Teachers felt it to be “threatening” and students were too insecure. They generally wanted to be given answers and suggestions rather than search for answers, even though they desired control over their work.

The importance of home-based experience

From the data, teachers gave no priority to what experiences and learning students might have or be receiving outside school. More importantly, they did not take steps to understand the possible impact of any parent/student relationships that might be impacting upon student learning. In several instances, students placed a great deal of value and trust on what parents had to say which creates a tension with what teachers are trying to promote. Students indicated consistently that they followed the advice of their parents and showed an appreciation of the skills and understanding that their parents had helped them to develop, even if they were not recognized as “technologically minded.” Carey has strong craft-based interpretations of the subject and frequently refers to the close link with her father:

Carey: “I used to do that with my dad....”

Interviewer: “Do you spend a lot of time with him doing things related to the subject?”

Carey: “Yes; a lot.”

The student is left to find, independently, a way of mediating the perceived conflict between the approaches of the people she trusts. This leads to certain insecurities and mixed feelings about some of the choices faced in and about her work. The impact of early experiences as young children with parents are of great significance with a number of students. Ewan had the benefit of a supportive, encouraging, constructive environment, with the benefit of extensive discussion about her activities. Her mother’s judgments still remain extremely important to her.

Dimensions of Creativity

In order to contextualize the findings from the research, an analysis of relevant literature is now presented.

Creativity and Design

In order to solve ill-defined design problems, complex strategies are frequently used by inventors and designers, sometimes working independently, but often working in teams. Barak, Maymon and Harel, (1998) discussed why teamwork has become increasingly important in modern industries:

Another factor that has created the need to work in teams is the information explosion and the need to solve issues that are more and more complex and multidisciplinary. (p. 86)

Personal resources, skills, vision and the ability to communicate are usually required to overcome competition and prejudice in order to appeal to the hearts

and minds of potential customers. Joyce et al. (1998) noted how “innovators” and “creatives” can currently command prestigious positions at all levels in the commercial world (p. 113). Solutions are never right or wrong, only better or worse and rely often on having a “feel” for the market place, the customer base and the developmental implications of a solution in order to make good judgements and decisions. Baxter (1995) stated:

Creativity is at the heart of design, at all stages throughout the design process. The most exciting and challenging design is that which is truly innovative; the creation of a radical departure from anything currently on the market. (p. 61)

Hill (1998) accepts this, but feels that creativity is apparent in different ways at different stages of the design process. Barak and Doppelt (1999) perceive creative thinking as “a combination of lateral and vertical thinking; a synthesis between imagination and logic” (p. 2).

The Nature of Creativity

At this stage it is important to consider what is meant by creativity and the nature of creative work that might take place in schools. Much of the historical concern for understanding the nature of creativity has been based on people thought to have special talents responsible for acts perceived to have high levels of worth. There is an agreement among seminal writers such as Koestler (1964), Feldman, Csikszentmihalyi, and Gardner (1994), and Gardner (1995) that creativity can result from planned activity, or can arise as a result of “flukes” or “accidents” within a domain of knowledge. There is closer agreement about the role of personality factors than there is about cognitive factors from their research. They record that particularly creative individuals, in order to make significant contributions to their chosen field, are often very demanding of themselves and committed to their tasks. Sometimes they can be “difficult” individuals, surrounded by tragedy and often marginalized from “ordinary” communities. Selfishness, intolerance, and stubbornness are frequently present and they enjoy complexity and asynchrony, which if not present are sought. Their work on the other hand can be breathtakingly refreshing and can energize others working in the field.

More recently in educational settings, there has been a concern to identify and promote creativity in all learners (Fryer, 1996; Beetlestone, 1998). This is the particular focus of the author’s research in keeping with that of National Advisory Committee on Creative and Cultural Education in the UK that proposed a “democratic definition” of creativity:

Creativity is imaginative activity fashioned so as to produce outcomes that are both original and of value. (p. 29) (Department for Education and Employment, 1999)

They proposed four main features of creativity:

- Using imagination, often to make unusual connections or see unusual relationships between objects, ideas, or situations.
- Pursuing purposes through having targets and reasons for working which can result in new purposes being discovered.
- Being original in comparison to their own work, the work of a small closed community such as peers or family, or uniquely original in comparison with those working historically or currently in a field or discipline.
- Judging value which demands critical evaluation and reflection; standing back and gaining an overview position (Department for Education and Employment, 1999).

The seminal work of Koestler (1964) and Feldman, Csikszentmihalyi, and Gardner (1994) showed a general agreement with this position. Creativity however belies simple definition and measurement and there are many agencies that act as stakeholders in the identification and rewarding of creative acts and processes. Csikszentmihalyi added that:

...focusing on the individual alone when studying creativity is like studying how an apple tree produces its fruit by only looking at the tree and ignoring the sun and the soil. (p. 146)

Creativity in Schools

The attitudes held by teachers about the place of creativity in schools are mixed. It is recognized sometimes as being a powerful motivating force for teachers and learners, can be a vehicle for high levels of individualized achievement, and can offer clues to learners' development patterns. Conversely, there are so many other priorities in classrooms that tend to dominate attention such as basic knowledge and skills, codes of response and behavior, and the conduct of relationships. These can result in disrupted classrooms in that they can challenge "norms" and "order." Creativity requires "high risk" teaching strategies with a concern for a "long term view" of learner's potential, a willingness to wait for results, and the confidence to act intuitively at times. Creativity is also difficult to evaluate and assess (Fryer, 1996; Beetlestone, 1998; Cochrane, 1975), which adds to the difficulties teachers face when prioritizing creative work.

Barak and Doppelt proposed that thinking skills need to be explicitly developed as part of a technology curriculum since "higher order competencies do not happen spontaneously." This promotion should also be expressed through adopted assessment procedures. McCormick and Davidson (1996) determined, however, that teachers often feel the central concern for learners is to construct a finished product, which undermines the fostering of an understanding of the design process and the creative element that is an essential part of it. Hill (1998) recognized the need for students to interpret design activities in technological problem solving as an opportunity to explore. This exploration:

...encourages student confidence in the freedom to explore and take risks. This confidence becomes critical when we understand that in creation and invention, there are always states of order and disorder. (p. 3)

Conclusions and Implications

There are many factors that contribute to anxieties when teaching design and technology. The teachers in this study were insecure about their understanding of creativity and their ability to exercise it even though they have views about its nature. They were unsure about certain aspects of their professional roles and realized a degree of role conflict between the interests of their department and their relationships with students. Insecurities did not usually surface and were normally screened by outward displays of professional confidence. Teachers are not universally multi-skilled in all areas of the subject and are most confident supporting work with which they are most familiar through their personal expertise. They know that it is important to keep their knowledge and skills updated and relevant to student needs and interests and are frustrated because of the difficulty in doing this.

The teachers who felt that they had made most progress in life through being risk-takers were better prepared to challenge learners at a high level and support them in risk-taking with their projects. A major concern among these teachers was that their students should avoid failure. Students were therefore not encouraged to be skeptical about success nor taught its value in the rigorous thinking and problem solving essential for creativity. The success that students experience boosts the confidence of the teacher. However, when students work beneath their potential then they tend to develop a negative, dismissive attitude about the value of the subject and its relevance. Rather, they expect to build confidence through working on challenging tasks. Fritz's (1996) studies with Australian students showed that students with high confidence going into an activity are more reflective about the learning processes they have mastered. For example, they identified transferable skills as their most important learning outcome. The desire to build confidence within areas where need is prioritized acts as a motivator for building competence. Fritz (1996) also identified a link between high levels of confidence and student independence. However, the teachers in this study did not feel able to respond to that desire for independence due to the institutional and legislative requirements that they are obliged to meet. As Davies (1999) found:

If the teacher chooses to make decisions on behalf of a student, they might not necessarily be acting in the best interests of the student overall. If teachers and learners share the risks associated with the learning process, better quality learning is likely to be achieved. (p. 107)

Writers concerned with learning development highlight the importance of verbal and non-verbal communication in the promotion of learner's progress (Piaget, 1932; Vygotsky, 1975; Wertsch 1979). Vygotsky illustrated the importance of teachers working with learners as equal partners in an

apprenticeship relationship. Rogoff (1990) developed the concept of guided participation, which suggests that:

...guidance and participation in culturally valued activities are essential to children's apprenticeship in thinking. ...Underlying guided participation is inter-subjectivity, a sharing of focus and purposes between children and their more skilful partners and their challenging and exploring peers. (p. 9)

There was little evidence that teachers felt able to develop such working practice with their students, as indeed the students did not convey any understanding or appreciation of any teacher's personal creativity. This in turn did not help to promote productive peer mentorship.

The students interviewed were impressionable and subject to a wide range of influences within and outside the school. When they felt well supported, their confidence levels were boosted and they made progress. When they feel frustrated, confidence was lost and often the teacher was blamed. In such cases they look elsewhere for their support, which is most frequently found at home. It is consequently important that teachers find out and account for the influence of parents and how this relates to student thinking. Ignoring the influence can at best induce the reaction that home experiences are not valued and at worst that the basis of the teaching and school experiences are worthless.

Students do not like to lose credibility with their peers and are reluctant to show the impact that loss of confidence makes. Hence teachers rarely read signals given by students in the right way unless they had a close relationship with them. Vygotsky (1978) proposed that children's cognitive development is embedded in social processes involving social relationships and socio-cultural tools. He suggested that when children (as novice partners), work with more skilled individuals or caregivers, they internalize the tools they require for creative problem solving. If students react negatively to the value systems that teachers promote, their response is to restrict themselves to "safe work," which they know will not jeopardize assessment results or examination success.

Barak and Doppelt (1998) noted that:

In the era of information explosion, change, dynamism and pluralism, there is an increased need for education to equip the school graduate with higher order cognitive skills. Future society may particularly reward those who not only possess logical thinking, critical thinking and problem solving skills, but are also enterprising, innovative original and creative.

This research confirmed their view that design and technology education can play a central role in contributing to student development, but that in order for this to take place, teachers must be empowered to become effective learners themselves. The profile of higher-order cognition must be raised and a better understanding of the nature of effective mentorship developed. The result should increase teachers' understanding of the impact of parents' influences on students work and promote an appropriate culture to foster trust and shared risk-taking with them.

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