Assessing the impacts of experiential learning on teacher classroom practice

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ABSTRACT

This paper focuses on the professional development of formal science educators through extraordinary experiences that occur within the realm of informal science learning. For many years the University of Colorado Denver (UCD) has offered programs that take teachers on "science learning journeys" to Africa, South America, through the Pacific, and many U.S. destinations through its Experiential Science Education Research Collaborative (XSci). On these adventures, teachers gain direct, first person experiences of unique and often challenging environments and multidisciplinary science within those settings. Similar professional development opportunities for teachers are widespread as summer programs through organizations nationwide. However, there is currently a lack of in-depth qualitative research investigating the actual benefits and interpretive nature of such programs as personal and professional "extraordinary" science learning experiences for the individuals who participate in them. The research agenda for the XSci Collaborative examines the experiences of educators engaged in informal extraordinary professional development experiences in order to understand the personal processes that make them extraordinary and valuable. Specifically, the primary research approach is to examine the *interpretation* of these experiences by teachers as case studies under the conceptual framework of a phenomenology. This approach utilizes several data sources, including teacher-created digital stories and video documentaries as personal narratives of their extraordinary experience; journals completed throughout the experiences, pre and post experience interviews, classroom observations and student interviews.

Key Words: Experiential Learning, Professional Development, identity

INTRODUCTION

Although many institutions offer experiential learning opportunities there is little in the literature about the value of informal science professional development approaches as lived experiences, how they are interpreted by educators, how meaning is made and communicated, and how such experiences are integrated into the identities and practice of those who choose to participate in them. Knowing this information informs designers of informal and experientially based science teacher professional development programs, the field of education researchers, and educators themselves about the nature and reflective processes involved. These outcomes promote better construction of such experiences in the future and contribute to the research base of these programs.

BACKGROUND AND RATIONALE

An emerging trend in science educator professional development is experiential learning through what can best be described as immersive and extraordinary informal experiences. Examples include fieldwork with scientists, experience in research labs, and STEM-oriented exploration, travel, and adventure. Experientially based learning strategies in general have a long history rooted in the early work of John Dewey (1938), and later evolved in work by Piaget (1950), Kurt Hahn (1957), Paulo Freire (1970), Vygotsky (1978), Kolb (1984), Jarvis (1987), and many others. Experiential education is best understood as a philosophy of education, in contrast to learning methodologies such as didactic or rote learning that are mostly concerned with knowledge delivery. In contrast, experiential education is concerned with learning from direct first-person experience and a holistic perspective that goes beyond content to include the construction of knowledge, attitudes, beliefs, and transfer of learning. Itin describes experiential education as a process where "Learners are engaged intellectually, emotionally, socially, politically, spiritually, and physically in an uncertain environment where the learner may experience success, failure, adventure, and risk taking" (1997). Quay asserts that learning through experience occurs at the level of the individual (constructivism), the small group (social constructionism), and culture (cultural discourses) (2003).

Although experiential learning outcomes have been receiving increased attention in the last decade (Baldwin, Persing, & Magnuson, 2004; Ewert & Sibthorp, 2009; Keys & Bryan, 2001), little research has been done to identify specific personal gains conferred by such extraordinary informal science learning experiences to educators. Important questions for the field regarding the benefits of extraordinary informal and experientially based education programs for teachers include: Does it impact their practice or sense of personal and/or professional identity in meaningful ways? If so, how is that meaning made? What is the essence of these experiences that makes them extraordinary? And ultimately, if the meaning of such experiences is created through individual interpretation (pre, during, and post experience) what is the process of constructing an extraordinary learning experience for oneself and others? The research approach generally addresses these questions through a case study research approach under the broader umbrella of a phenomenology study. The goal is to focus on the lived experiences and individual meanings constructed by participants engaged in extraordinary professional development experiences from their respective points of view in the form of narratives, while also

considering what the experiences may have in common as phenomena unto themselves (i.e. the essence of the experience for all involved), if such commonalities can be found.

Case study research, as discussed by Creswell (2007) examines an issue or event (in this study, an experiential learning opportunity), "through one or more cases within a bounded system" (p. 73), and implies a methodology as well as describes the research products. The bounded system here is defined from when the teachers sign up for the professional development experience to several months (or even years) after the completion of their personal narratives communicating their experiences. In these studies, each teacher's professional development experience are treated as a separate case in order to maintain his or her individual story and point of view.

The approach is informed by identity theory and what Psychologist Dan McAdams has referred to as "the narrative study of lives" in his book *The Redemptive Self* (2006). This approach considers the internalized life stories people create to make sense of their lives as "narrative identities" and the notion that such narratives determine what we do and how we make sense of what we do. In the parlance of identity theory, this can be tied to the concepts of identity construction, agency, and the resultant social and professional behaviors – in this case, classroom practice and student-teacher relationships.

Additionally, an overarching phenomenological structure forms the research context for the case studies, and is intended to consider the question of what the different teacher experiences might have in common that makes them "extraordinary," if anything. To answer this question, XSci seeks to describe the essence of the extraordinary experience through the elements that transcend the individual cases and apply to the experiences commonly or as shared elements emerging from the individual case studies (Creswell, 2007). This method uses van Manen's hermeneutic phenomenology approach (1990), which considers the interpretation of lived experience through various "texts," (which can include multiple data sources) and seeks essential themes to describe and represent the nature of a given experience in broad and specific terms.

Importantly, this technique goes beyond mere description to also integrate the interpretation and interpretive processes of the researcher regarding the meaning of the lived experiences, rather than attempting to *epoche*, or bracket out, the researcher's point of view (van Manen, 1990; Husserl, 1931). The theoretical basis in conducting this research is rooted in constructivism as described by Piaget (1950), Bruner (1961), Vygotsky (1978), Bransford, Brown, & Cocking (2000), Kim (2005), and others. This stance is reflected in the operational definition of "experiential education" as a starting point for considering the extraordinary learning experiences in this program:

> A transactional learning strategy in which educators and learners co-engage in direct experience and focused reflection, in concert with private personal interpretative processes on the part of the learner, to construct knowledge, develop skills, and contextualize the meaning of the experience.

In a teacher experiential learning scenario then, the professional development trainers or designers are defined as the "educators" and the teachers being professionally developed are defined as the "learners." Given this stance, the researcher actively looks for events, instances, and reflections in which the process of knowledge construction and

meaning making is taking place. This may include evidence of, or references to: collaborative learning and deep personal introspection (Brooks & Brooks, 1993, 1996); the existence and evolution of mental frameworks, structures, or schemas (Zemelman, Daniels & Hyde, 1993); and narrative accounts of development of or changes in identity (Henke, Chen, & Geis, 2000).

For this last component, identity, the protocol applies tenets of identity theory. Identity theory is built upon the notion that society is organized and has patterns. The self emerges within the context of this organization through what Stryker dubbed "structural symbolic interaction" (1980) through the use of language and symbols based on shared meanings within a society or culture. William James (1890) posited that there are as many selves as there are positions that one might hold in society and as there are groups who respond to and interact with the self. We each have multiple identities, each one an agent capable of choice, action, and role taking (e.g. parent, friend, teacher). Therefore the notion of identity is somewhat distinct from the person owning them, but describes avenues for behavior and transactions within society based on shared meanings within particular cultural structures. In this capacity, "professional identity" or "science educator identity" – is a role-based designation and is endowed with all the accoutrements, expectations, and responsibilities one understands it to mean.

But identity is also a theoretical construct existing in the mind of the individual and gives rise to the sense of self. Self is a person's consciousness of his or her own being (Burke 2009). It allows each of us to reflect on and evaluate ourselves as both subject and object, planning and modifying on this construct to bring about desired future states. This is personal growth. Further, the self is born out of social interaction and experiences within the environment and most notably the complex structure of society and culture (Mead 1934). Because we can each assume different positions within society, the self reflects these by way of multiple identities. Therefore, the self can assume agency through identities, and is in part comprised of the sum total of those identities – which are fluid throughout our lives.

Viewing constructivism through the lens of identity theory, this approach takes the position that the learning of new things can go beyond incorporation into an internal framework for understanding to actually inform, modify, and become integrated into a person's identity. In short, the construction of new knowledge is, in fact, identity construction. While constructivism stresses the building of understanding through an ongoing process of linking new ideas and information within internal constructs or schemas based on previous learning, identity theory goes one step further to then also incorporate the self into the equation in the form of the relationship of the knower and the known as an essential element to learning, meaning making, and personal growth. Viewing professional development as a form of identity construction is important because it changes the notion of teacher training from one of content or methodology training to consider the larger relationship of the educator to new knowledge and its integration into his or her self perceptions.

XSci Application

In setting up experiential activities certain organizational considerations and areas of outcomes are investigated in the research. See Figure 1 (Appendix).

XSci EXPERIENTIAL LEARNING DEFINATIONS

Defined Experiences

Clearly science interest, skills, and knowledge are developed in many places, at many times, and through many mechanisms. The driving questions commonly determining selection of experiential learning sites are: what things are to be learned and experienced and how these experiences will be supported, amplified, or expanded at different times and in different environments? This approach determines what is the role of the experience, both as an entity in itself and as an addition to other formal educational experiences. There is a need for knowledge, derived from both practice and research, about how these different settings work together. To meet these objectives XSci's partnerships include a range of experiential opportunities extending from internships with a museum or the national park system, research with NASA, NFS and others, and extraordinary field experiences to expand content understandings and challenge participants.

EXPERIENTIAL LEARNING CHARACTERISTICS

XSci experiential learning is a process through which a learner constructs knowledge, skill, and value directly from an experience within the environment. In many respects it is not unlike situated learning or place based learning. Content learning within these environments occurs when carefully chosen experiences are supported by anticipation, reflection, critical analysis, and synthesis. Experiences are structured to require the learner to take initiative, make decisions, and to be accountable for the results. The results of the learning are personal and self constructed preparing for and leading to future experiences and learning. Understandings are developed and deepened. Shared experiences within a group or cohort influence this learning. Lave and Wenger (1991) suggest that individuals learn as they participate by interacting with a community, its history, assumptions and cultural values, rules, and patterns of relationship; the tools at hand, including objects, technology, language and images; the moment's activity, its purposes, norms, the practical challenges. Shared knowledge emerges from the interaction of these elements. Activities that involve professionals in open and dynamic discussion, mutual problem solving and/or collaborative learning draw the participants into a community of learners or professional cohort and contribute to a deeper understanding of the science concepts and content expressed during the experience. The increased content, process, an even personally affective understanding enhances the professional efficacy of the participant resulting in more confident practice (Marlow, 2011, 2009).

The use of a field site considers this theoretical base in planning meaningful activities. The field experience is designed to meet all of following program objectives.

A) Increased understanding of science content and concepts through first-person experience
B) Extraordinary experience as determined by participant as extraordinary

C) Learning - personal and self constructed
D) Challenging, high stakes with possibility of failure
E) Participation within a cohort as part of a community of learners

PARTICIPANTS IMPACTS

Narrative Identity

We explain experiences to ourselves in the form of narrative. Narratives form our identities. The relationship between narrative and identity is an internal transaction. Narrative provides input to identity as the form and method of identity construction. In turn, our sense of identity thus formed contributes back to our evolving narrative through the output of meaning or how we make sense of our relationship to the experience and potentially to other experiences. The best teachers have the best stories. Extraordinary professional development experiences give them the opportunity to form incredible stories and thus incredible identities. The result back in the classroom is not simply what they tell students, but how they view the related content they teach students, their newly formed relationship to that content, and how they model such understanding, that is ultimately important.

Content Understanding

The complexity of content and its relationships are best understood through direct experience with that content. Situating the learning in extraordinary experiences creates deeper understanding of content vs. memorized content routinely accomplished through textbook use. Although students are not participating in the experience, their teachers have and in the process better understand the content they teach. In addition the descriptions of the content delivered through first person narration may better inspire the students and model for them an exciting and positive way of relating to science.

Professional Self

The quality of a teacher resides in their experiences. These expertises are developed through a combination of their formal and informal experiences. Formal and informal experiences contribute to content depth and profundity, content application understandings, pedagogical knowledge and use, and professional interactions all resulting in a strong teacher sense of professional self. Identity is revealed in the form of a sense of agency, which in turn results in social behaviors - what they actually do as educators and how they do it.

Content Communication

The transfer of content understanding to students is impacted by the depth and breadth of teacher understanding of that content. The more experiences a teacher can draw upon relating to the content in a direct first-person way, the better they are in relating it to a range of students. In addition the ability to engage students through first-

person stories about the content enhances their understanding and interest in understanding the content. Modeling the way the teacher thinks about and understands the content helps students understand this content and gives them examples for approaching future content.

Personal Relevance

Self is a person's consciousness of his/her own being. Each person has the capacity to reflect on desired future states and move towards such goals. This is personal growth, allowing each of us to evaluate ourselves as both subject and object, planning and modifying on this construct to bring about desired future states. Therefore, continued monitoring of participants following an extraordinary experience to determine if they seek out other experiences and continue growth is an important component to consider after the actual experience.

STUDENT/COLLEAGUE OUTCOMES

Inspiring through Stories

The most influential classroom teachers are those who can effectively take their students on extraordinary journeys of discovery, whether of the mind, spirit, or body. Teachers themselves derive inspiration from their own extraordinary life experiences and endeavor to bring them into the classroom in ways that engage students in the process of inquiry through a variety of creative methods and tools. Quite often this is done through the teacher's personal stories.

Inquiry Process Understanding

Many teachers' only experience with inquiry stems from coursework labs following detailed directions with predetermined results and when presenting inquiries in their classrooms follow this model. Learning how to do and thus lead inquiries they must experience true inquiry (research). Inquiry by its nature contains a certain amount of dissidence, many times demonstrating out as frustration by students. A teacher's recognition of this and not allowing the feeling to end the experience is important. Guiding the students to work through the inquiry experience utilizing proper scientific approaches to come to correct understanding is essential for student success.

Modeling Involvement

An important part of teaching is when a teacher models how to deal with content and make sense of phenomena. An expectation that all students bring a problem-solving schema to content is false. Educators would expect that eventually students develop these skills but many need this modeling before that happens. Another aspect of modeling is a teacher's love of science and curiosity to learn more. This can be contagious and lead to a co-creation of a science identity.

Co-creating Science Identity

Science identity construction, like any form of identity construction is based on experience, agency and role taking. An area of research interest relating to the teacher's professional (science) self is whether enhancement of self may result in co-creation of science identity with their students. Generating excitement, modeling science inquiry, retelling personal experience, all may contribute to a classroom community that values science and create student science identities that encourage their interest and future involvement in science learning.

Content Engagement

The more tools a teacher has to deliver and understand content the more likely they will engage students. The more experiences the teacher has with the content the better they understand it and the more likely they will expand the ways they are able to express understanding. Teacher stories enrich the content delivery. Relying entirely on textbooks and worksheets to interest and engage students is usually unsuccessful.

Attitude for Sustained Learning

Generally participants in ongoing experiences already have a positive attitude toward sustained learning. Whether those that participate in the first experiential activity continue to seek out additional experiences is part of the research agenda. For those that seem to already have this direction the research agenda evolves into whether they are able to pass this on to their students.

METHODOLOGY EXPLANATION

Regarding the case study and phenomenological aspects of this type of research, the approach follow a general model for data collection common to qualitative research, as identified by Madison (2005), Huberman and Miles (1994), and Wolcott (1994). This includes a phase of collecting and organizing the data for analysis, a phase of applying a coding and condensing process to reduce the data into themes and categories, and a phase of representing the data as findings using a variety of tools (narratives, discussions, figures, etc.). Typically, these phases form a data analysis spiral and occur in an interrelated and iterative fashion, rather than a linear one (Creswell, 2007).

Data collection occurs before, during and following the extraordinary experiences. This method uses purposeful sampling in selecting participants for the research from these trips who are willing to take part in the study, including some who create video documentaries of their experiences.

For the purposes of this research, given its emphasis on narrative interpretation, it is not necessary to control for the variety of experiences teachers might have. After all, even on the same trip, teachers will invariably have very different experiences. What is important for the study is that participants have what they would call an "extraordinary experience." Then the research questions regarding the nature of the experience and their interpretation of it can flow. Also, since the research focuses on extraordinary professional development experiences related to science, it is critical that all experiences

studied include science learning in some way (although not all educators included have to be science educators).

Examples of such experiences include teachers travelling to Peru and Easter Island where they journey through the Andes mountains, visit the ancient city of Machu Picchu, hike part of the Inca trail, and explore the remnants of a society that depleted their natural resources ages ago, leaving only majestic stone statues on Easter Island as evidence of their existence. Another example is teachers travelling to Africa to climb the largest free-standing volcano in the world – Kilimanjaro, travel through the Serengeti – one of the last great wilds on the planet – and visit AIDS orphanages and villages beset with social, economic, and health challenges.

For some, these experiences represent first time encounters with foreign travel, different cultures, even the ocean, or represent a personal challenge. In any case, such experiences are potentially transformative experiences and provide numerous opportunities to touch teachers in unique and highly personal ways, and this is the criterion important to the research.

The role of the research is to conduct the data collection and analysis through interviews, reviews of narrative journals, review of online group sharing via Facebook, and the review and deconstruction of teacher-created video documentaries.

It is important to recognize that the participating teachers are not seasoned filmmakers and will be learning the editing software and post-production process to some extent while they develop their documentaries. Therefore the research team assists them in technical ways as they complete their films. The research team is careful to give general guidance and options in such cases, rather than specific interpretive input.

Alternatively, the researcher's experience as designers of similar professional development experiences greatly informs the research approach and questions identified, providing potentially important insights. The identification and inclusion of the researchers own interpretation of the data and the stories presented by the teachers is part of the reason to use a hermeneutic phenomenology structure. To facilitate the researchers keep a reflexive journal throughout the research process and incorporate it into the final report.

The researcher gathers a wide range of data in this research approach to allow for comparison and triangulation across the different experiences and to examine congruency among the different forms of data for validation. Data sources include: 1) iterative and recorded participant interviews and observations (immediately post-experience, during and after the video editing process, and several months post-experience); 2) participant travel journals as written narrative forms; 3) teacher-created video documentaries as multi-dimensional narrative forms, and; 4) shared narrative threads (including comments, stories, photos, and videos) typically posted among groups on Facebook.

The interviews are individual, semi-structured, guided interviews focused on open-ended questions to allow for the emergence of themes and identification of themes. Each is video recorded for later transcription and open-coding analysis, and takes observational notes during the interview process.

The review of the participant travel journals involve treatment of them as narratives using narrative analysis and an open-coding approach to identify emergent themes and categories, and to include significant quotations and comments that represent them. The protocol imposes a narrative structure *a priori* for teachers to use when

writing their journals in order to facilitate narrative form. During this process it relies heavily on the reflexive research journal to compose reactions to and interpretations of the narratives, make metaphors, and attempt to relate emerging themes to the theoretical base of constructivism, and the theoretical framework (Wolcott, 1994).

Regarding the analysis of the video documentaries as data sources, the research uses a narrative analysis approach that considers each film as holistic stories, as well as a deconstruction of its elements in order to better elucidate the multi-dimensional meaning of the films. This approach in informed by two previous approaches. The first was described by Yussen and Ozcan (1997) and examines five elements of plot structure: characters, setting, problem, actions, and resolution. The second was described by Clandinin and Connelly, (2000) and examines three dimensions: interaction (personal and social), continuity (past, present, and future), and situation (physical places or circumstances). Under this framework, the researcher applies a visual coding strategy to examine the imagery chosen by the video creators to identify visual themes and categories, a verbal-linguistic coding of dialogue and/or narration based on a textual transcription of each film to identify text-based themes and categories, a scene-by-scene plot mapping approach to create a conceptual map of each film to examine the sequential order of "scenes" chosen or developed by the video creators, and finally a running narrative commentary in which video creators comment in real-time about their choices and what they were "going for" in their documentaries. This is modeled on the "director's commentary" option common on DVD movies as part of the special features menu and is recorded for video playback with commentary.

Finally, the shared narrative threads on Facebook involves a review of the postings by group members from each extraordinary experience as different threads. For example, a given posting of a comment, story, photo, or video typically initiates a thread in the form of responses and additional postings. These threads can be identified, mapped, and coded and then compared for emergent themes and agreement or disagreement among responders. Additionally, the impact of this form of sharing and response generation can be included in the guided interviews to examine their impact on the post-trip framing of the experience. This approach represents a new area of data collection.

Once the initial data collection is completed, the researcher embarks on an iterative interpretation process, which will include each participant and apply both the case study design and the phenomenological framework. For the case study approach, the process applies the design described by Stake (1995), treating each individual participant's experience as a separate case and using the multiple data sources discussed above to formulate a detailed description of each case. This description includes each case history, chronology, day-by-day activities, significant events, interpretations, and will synthesize the themes initially identified from the various data sources into comprehensive emergent themes. The result is a *within-case* analysis of each case (Creswell, 2007).

Following this step is a *cross-case* analysis to examine the emergent statements and themes across all the cases and consider the different extraordinary experiences as shared experiences, or phenomena. The overriding issue addressed by this phenomenology approach is what it means to have an extraordinary professional development experience. The researcher uses van Manen's hermeneutic phenomenology

approach (1990), using "text" as described earlier. For this research, the "text" for analysis includes all of the data sources described above. From these sources, significant statements revealing how the teachers experienced the phenomena of the extraordinary experiences are identified across the cases. From this analysis, the researcher identifies the themes and meanings which seem to be shared among all participants and yield an understanding of what each experience was like, what made it extraordinary, and how meaning was made and identity constructed by participants in their interpretation of their experiences. The result are detailed written descriptions of what they experienced (textural description) and the context (internal or external) that influenced how the extraordinary experiences (structural description). These descriptions will be compiled into a composite description that represents the "essence" of the experience shared among all the participants. This hermeneutic approach integrates the interpretation and interpretive processes of the researcher regarding the meaning of the lived experiences, rather than attempting to bracket out, the researcher's point of view.

During this process the researcher shares the initial findings with participants as a starting place for the co-construction of the final interpretation of the data until it accurately represents the personal experience for each participant to their satisfaction. This includes member checking in the form of additional interviews and collaborative data review sessions, culminating in the final deliverables describing their experiences as represented in the different data sources. Further, the researcher actively seeks to identify discrepant information and explore its meaning within the context of the study in collaboration with participants as a form of negative case analysis.

SUMMARY

The intent of XSci is to elucidate the meaning of and processes for constructing extraordinary learning experiences for oneself and others. It focuses on extraordinary professional development experiences for educators, with the point of view that teachers are uniquely attentive to learning processes and are well equipped to help us, as the researchers, articulate their constructions of identity and meaning and significance regarding these experiences. However, there is currently a lack of in-depth qualitative research investigating the actual benefits and interpretive nature of such programs as personal and professional extraordinary experiences for the individuals who participate in them. If a teacher goes to Africa and climbs Mount Kilimanjaro, how does it matter to them as professional educators? Does it impact their practice or sense of personal and/or professional identity in meaningful ways? If so, how is that meaning made? What is the essence of these experiences that makes them extraordinary? And ultimately, if the meaning of such experiences is created through individual reflection and interpretation, what is the process of constructing an extraordinary learning experience for oneself and others?

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APPENDIX

Figure 1 – Organizational considerations and resulting outcomes

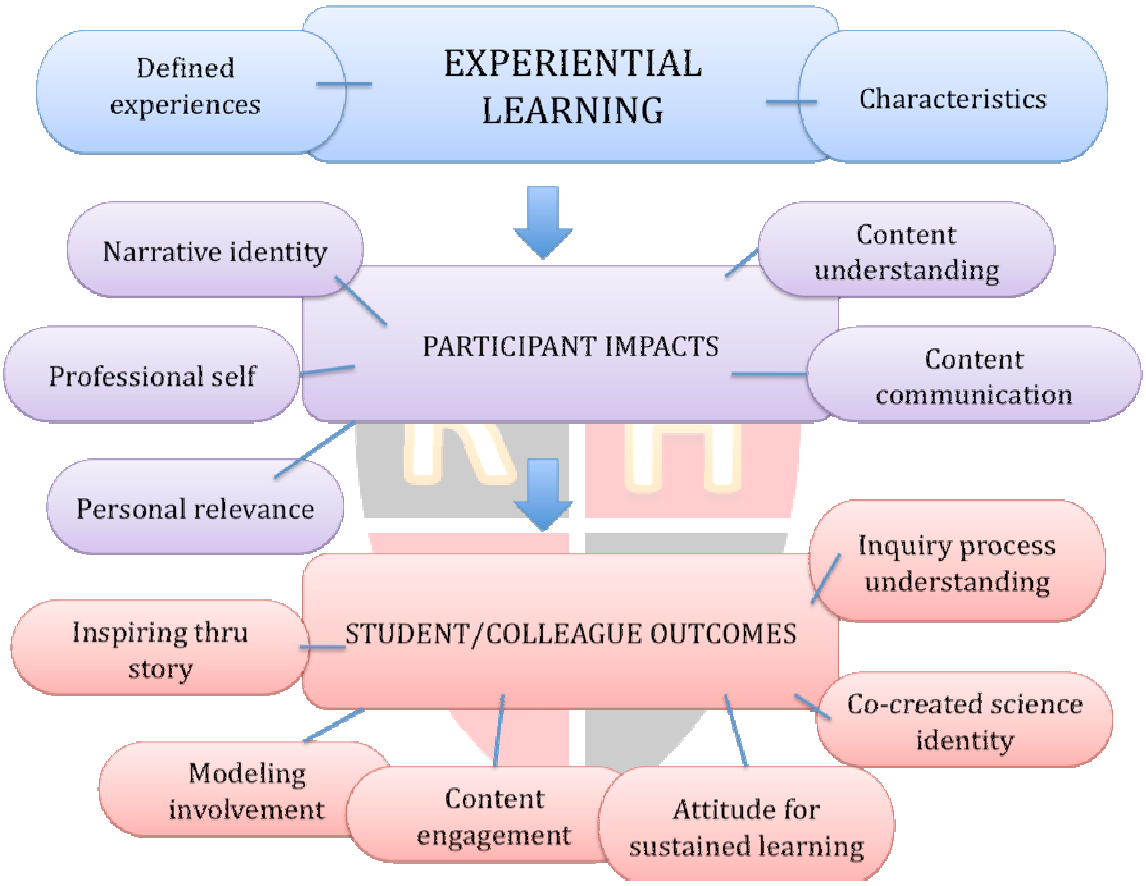

Figure 1 Organizational Considerations and Resulting Outcomes