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The Complex Nature of Learning Failure: A Student Perspective

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ABSTRACT

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The purpose of this study was to explore how college students reflectively describe their learning failure experiences, along with the major themes of those experiences. Through a series of in-depth interviews, four narrative cases written from the perspective of two college students were developed. These four cases were then carefully analyzed and cross-examined to generate a deeper understanding of college student learning failures. This study explored approximately 78 themes related to these four cases, which led to the development of six key components of college student learning failure experiences: Recognizing Learning Failures, Evaluating Learning Failures, Attributions for Learning Failures, Self-Discovery Through Learning Failure, Past Experience and Future Expectations, and Social Influence. These components helped to define an initial framework for guiding future research into college student learning failure experiences.

Keywords: Learning Failure, Attribution, Fear of Failure, College Student, Academic Failure

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I would like to thank my wife, Amber, for her untiring support, encouragement, and thoughtful feedback as I have worked over the last several years on this project. Her educator’s mind has kept me focused on the true impact and value of this research — successful student learning. I also acknowledge the help I have received from heaven. Countless inspirations, insights, and breakthroughs have come as I have studied, pondered, and sought answers to the questions this study has raised in me. This project has been transformational for me and for those that I have interviewed. May the transformation continue in all of us.

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DESCRIPTION OF THESIS STRUCTURE

This thesis, *The Complex Nature of Learning Failure: A Student Perspective*, is a qualitative research study report written in a traditional thesis format. The preliminary pages of the thesis reflect requirements for submission to the university. The introduction contains a brief overview of the academic literature associated with the problem to be addressed by the thesis study. It also describes the purpose and research questions of the study. Following the introduction is a section on the methods used in this thesis study regarding participant sampling, data collection, data analysis, and rigor and trustworthiness measures. Following the methods section is a findings section reporting the results of the study. Following the findings section is a discussion section in which the findings of the study are reviewed in light of existing research, including implications for research and practice. The literature review is included in Appendix A. Appendix B contains the study participation invitation email. Appendix C contains the initial participant consent form. Appendix D contains the final participant consent form. Appendix E contains components of the audit trail of the study. Appendix F contains the interview and transcription protocols used in the study. This thesis format contains two reference lists. The first reference list contains references that would be included in a journal-ready article. The second list includes all citations that would be used in both a journal-ready article and the section entitled “Review of the Literature.”

Introduction

Learning can be described as an intentional activity in which students set learning goals and work to accomplish them (Bereiter & Scardamalia, 1989). Given this definition, learning failure was defined in this study as an experience in which a student intentionally set a learning goal but failed to achieve it. As learning failure is a ubiquitous part of learning, it ought to be a critical part of educational research. However, what was found in the learning failure literature was an impoverished cannon of studies that focused on a few critical factors — most often for the purpose of categorizing and controlling learning failure. Of all the populations studied, college student populations were the least explored — both in terms of volume and quality. These studies were primarily reductionist in their approaches and had generated a limited understanding of the themes inherent to learning failures. Consequently, the research was fragmentary, lacking a general synthesis of ideas that would make future learning research more productive. This study was designed to explore learning failure from the point of view of a single student using a qualitative case study approach. The cases generated in this study were used to document and analyze themes from learning failure experiences that expanded on those currently found in the learning failure literature.

Studies relating to learning failure have been present in education literature for several years. Quantitative studies have dominated the learning failure literature over the past four decades, with most findings being characterized in terms of interaction effects and correlations (Bailey, Helm, & Gladstone, 1975; Bayton & Whyte, 1950; Buck & Scammon, 1966; Chen, Chen, Lin, Kee, &Shui, 2009; Chen, Wu, Kee, Lin, &Shui, 2009; De Soto, Coleman, & Putnam, 1960; Peetsma, 2000; Schlenker, 1975; Seli, Dembo, & Crocker, 2009; Smith, Ryan, &Diggins, 1972; Struthers, Menec, Schonwetter, & Perry, 1996; Wei & Ku, 2007). In qualitative research,

case studies were the predominant approach for exploring learning failure. These case studies typically came from interviews with students and from the self-reflections of the researcher (Cox, 2009; Matson, 1991; Taylor, 2008). While this body of research has generated many contextualized insights into learning failure, there were no studies that explored how students experience and work through their failures from their own point of view. Additionally, the learning failures were too often reduced to the point of oversimplification by operationalization — without the attempt to understand their complexity and dynamic nature. Through a series of interviews in the present study, multiple cases of learning failure were developed and analyzed in a way that can improve our understanding of the complexities of learning failures. An understanding of learning failure experiences — from the student perspective, can lead to improved instructional design and pedagogical practice.

Statement of the Problem

The scholarly literature related to learning failure can be summarized by the following six insights: (a) students are prone to avoid failure depending on how they perceive the task and its social implications (b) failure, when followed by success can engender intrinsic motivation (c) fear of failure can motivate students to achieve (d) self-esteem is a construct that mediates reactions to failure (e) "facilitative anxiety" (Feij, 1975) can have a beneficial effect on some types of performance and (f) how students perceive past failures can affect achievement and motivation in the future. The theoretical paradigms of attribution theory and fear of failure in this research have produced a large number of studies, providing significant insight into learning failures. But there is more to understand about learning failure beyond these themes.

Directly exploring learning failures can be challenging because of the difficulty observers and participants, themselves, have in identifying when they occur. Additionally, there are a

myriad of themes associated with learning failure that make the experience highly contextual and difficult to evaluate using objective sets of criteria. The causal attributions that learners make for their failures can be especially difficult to identify and classify (Diener & Dweck, 1978). Students also may not be honest about their learning failures. Some students, not wanting to admit their shortcomings, may make excuses for why they failed. Clifford (1984) described this idea when she said "individuals who attribute failure to lack of effort as opposed to lack of ability often do so to protect self-esteem and thus they may, in fact, intentionally reduce effort to validate their attributions for failure" (p. 112). Thus, students may have personal reasons for not being honest about their learning experiences. This self-deception makes it difficult for external researchers to directly observe learning failures.

From the literature review it can be seen that one critical area of learning failure has been overlooked — the way in which students experience and work through their learning failures. All of the studies reviewed in this literature focused on observations made by researchers that either validated or challenged preconceived hypotheses. By contrast, there was no attempt made to document learning failure experiences from the student perspective, which suggests that we know little or nothing about how students experience their learning failures. Case study was the predominant research approach used to study learning failure in this review, although its methodological application was focused more on answering quantitative research questions than qualitative. Therefore, it is imperative that future research into learning failure that utilizes case study needs to do so with more descriptive and analytical methods than have hitherto been employed. This new research may provide a depth of insight into learning failure that can illustrate its complexities, multiple dimensions, and integral relationship to successful learning

experiences. This improved insight can help us improve our instruction in ways that will improve student learning.

Statement of Purpose

The purpose of this study was to document additional themes associated with college student learning failure beyond those characterized in the academic literature — specifically fear of failure and causal attributions for failure. Along with these additional themes, this study was also designed to document college students' perspectives of their own learning failures.

Research Questions

This study addressed the following research questions:

1. How does a college student reflectively describe and explain his/her learning failures?
2. What are the important themes of learning failure experiences from a college student's perspective?

Due to the nature of this study, these questions evolved in conjunction with the improved understanding of learning failure that came from the research experience. The contributions of this study included: (a) an improved understanding of what learning failure is from a student perspective (b) improved instructional design principles due to a better understanding of student learning experiences, and (c) improved research on learning failure due to better methodologies refined through this study. It is also possible that the findings from this study may inform perspectives on learning failure among populations other than just college students. As such, this study had the potential to make significant contributions to a variety of disciplines not fully realized at the time the study was conducted.

Method

This study followed a multiple-case study approach as outlined by Stake (2006). This approach was selected because of the nature of the research questions in this study. The purpose of the study was to generate a clear portrayal of how college students reflectively describe their learning failures. Additionally, the major themes associated with these learning failures were to be documented, thus augmenting the existing themes from the literature — attributions for failure and fear of failure. The narrative cases developed from the selected multiple-case study approach would provide appropriate material for addressing the research questions and purposes of this study. This section will first address the participant selection process. Secondly, it will address the data collection and interview processes. Third, it will address the data management and transcription process. Fourth, it will address the building of the case narratives. Fifth, it will address the case analysis process. Finally, it will address the rigor and trustworthiness strategies.

This study sought to explore college students' learning failure experiences from their own perspective and to expand the range of themes currently presented in the literature. Especially important was the emphasis on the highly complex and complicated nature of learning failures. This study used four in-depth cases of learning failure experiences from two college students to illustrate their various themes and complexities. The complexities of each learning failure experience were explored in terms of how they differ from one experience to another. Analyzing these complexities and themes has contributed greater understanding of how students experience their learning failures. Therefore, it was important that participants be identified who could articulate their learning failure experiences and who had the capacity to critically reflect on those experiences.

Each learning failure experience served as a case that could then be analyzed. Multiple instances of learning failure were studied as cases as well as those of multiple participants in order to focus the study on uncovering the themes and complexities of the experiences. By focusing on learning failure experiences as cases, a richer analysis was developed and multiple themes across the experiences were explored. This was a unique method, as every other study reviewed in the literature defined cases in terms of participants, not experiences.

Participant Sampling

Given the timeframe for this study, it was realistic to work with five students initially to find those who were capable of articulating their learning failure experiences with the necessary detail. Having the final participants articulate two learning failure experiences in detail was sufficient to illustrate the complexities of the experiences. The initial participants for this study were students who had intentionally tried to succeed in learning course concepts, but failed to do so based on their poor grades in their courses. Identifying the participants by their grade failure was done based on the assumption that their grade failures were due largely to their learning failure experiences. Additionally, the participants in the study had to be able to critically reflect on their learning failure experiences to sufficiently develop the cases for this study. The initial five participants were each interviewed once to determine their fit for this study. There were three criteria for selecting final participants for this study: (a) the student intended to succeed at learning but failed (b) the student was able to critically reflect on and articulate his/her learning experiences and (c) the student was available for multiple interviews that were necessary to compile the cases for the study. Eventually, two final participants were selected to share their learning failure experiences. This sampling technique, according to Patton (1990) is called "critical case sampling" (p. 174).

The Brigham Young University (BYU) Office of Freshman Mentoring was originally assisting with the identification of initial participants for this study because they had already identified a population of failing students based on grade reports. After a short time, they suggested that the BYU Academic Support Office might have a larger population of struggling students. However, it was deemed that the Academic Support Office population was a vulnerable population, so the Academic Support Office suggested that an invitation for participation be sent through individual college advisement centers. Eventually, the BYU College of Life Sciences sent out an Institutional Review Board (IRB)-approved participant invitation for the study to which several students responded. From those students who responded, five were selected for the initial phase of the study as mentioned above.

Data Collection

The data for this study were collected through several semi-structured interviews. One initial interview with each of the five original participants was necessary to determine which participants would be the best to work with. In total, four in-depth interviews were conducted with each of the final participants to document their learning failure experiences sufficiently for analysis. The primary researcher also kept a reflective journal that included thoughts and insights into the cases that were considered during the analysis of the cases. This reflective journal was kept through an online blog and served as part of the audit trail for this study.

Two in-depth learning failure cases for each participant were sufficient to explore the major themes of the participants' learning failures. At the beginning of the first interview, each participant was given a copy of the IRB consent form to read over, initial, and sign. A copy of the signed form was provided to the participant after the interview. The initial interview began with an explanation of the general purposes of the study. Each interview was recorded with the

participant's permission. A sample interview protocol form is included in the appendices of this report. The wording of the questions in the interview protocol was generic because participants' own words and concepts were used when appropriate. The questions in the interview protocol were specifically designed to address the gaps in the literature and to build upon findings from previous pilot studies.

Each interview lasted between thirty to sixty minutes. The interviews were recorded using both a Live Scribe Pen audio recording device as well as a MacBook Pro audio recording device. The dual recording devices were necessary to ensure adequate recordings of the interviews and to prevent against the case in which one of the audio devices failed. All of the audio recordings for this study were transferred to a password-protected folder on the MacBook Pro laptop computer after which the audio files were erased from all other locations. Maintaining the documents and files associated with this study in a secure location ensured access to the information as needed for a thorough analysis.

Care was taken in the interviews to avoid leading questions so that the emic perspective of the student could be easily distinguished from that of the researcher. The reflective interview methods of this study involved a certain level of co-interpretation of the learning failure experiences being documented. The reflective journal of the researcher was included in the audit trail to help reviewers distinguish between the student perspectives and those of the researcher. While complete disassociation of perspectives was impossible due to the necessity of interaction and interviewing, the researcher influence was documented, fully disclosed, and critically reviewed (Lincoln, Lynham, & Guba, 2011).

Data Analysis

Over the course of this study, the audio recordings of the interviews were transcribed using a combination of speech to text software, transcription software, and Microsoft Office applications. No one was hired to assist with the transcriptions. Working through the transcriptions helped the researcher become familiar with the data in ways that promoted deeper analysis. To guide and standardize the transcription process, a basic transcription protocol was developed andis included in Appendix F. These transcriptions ultimately served as part of the audit trail and helped with member checks and peer reviews.

Once interviews were transcribed, the researcher carefully reviewed each transcript at least three times to develop the patches (Stake, 2010) that would become the basis for building the cases. During this review of the transcripts, the researcher identified and coded meaningful quotes and passages that reflected the students' perspectives on their learning failure experiences. Special attention was given to documenting the context of each experience and the student's perception so as to generate thick descriptions of each learning failure and to make the critical themes more obvious. These quotes and passages were then sorted into groups by student and by the course in which the experiences occurred. Cases were composed from the patches or meaningful episodes from the student's learning failure experiences according to the courses in which they occurred as well as their emergent themes (2010). The course in which the learning failures occurred emerged from the data analysis as a natural bounding principle for the cases. These cases were intentionally developed as narratives of the participants' perspectives, using their own words, to make the cases thick and to improve transferability of the themes. Once the cases were developed, the research questions of this study framed the analysis of the cases. Through the case building process of the study, three cases were developed for one participant

and six cases were developed for the other. In order to focus the study, the two cases from each participant that most contributed to the aims of the study were selected for analysis. The selected cases were chosen through the process of negative case analysis as a means to further document the range of themes related to learning failure experiences. This sampling technique is called extreme case sampling according to Patton (1990).

Several readings of the cases and progressive coding were used to analyze the data and identify the critical themes of the student's learning failures (Stake, 2010). These themes were associated with codes that were used for marking the cases. The codes and themes evolved over the period of several months as cases were reviewed and negative case analysis was performed. This was the main process for developing the codes and themes for this study, which served as another component of the audit trail. The codes and themes were tracked using Stake's multi-case worksheets which have been included in Appendix E. Due to the program evaluation emphasis of Stake's approach, some of the worksheets were not used or were modified to better suit the purposes of this study. Specifically, worksheets 1, 5, and 7 were not used and worksheet 5 was modified.

The quintain (Stake, 2006) of this research study was learning failure and the bounding principle for each case was the course in which the experiences took place. The major approach to case analysis was the identification of unique characteristics and themes across the learning failure cases developed in the study. The themes of the cases were catalogued and then compared across the cases using Stake's worksheets (p. 49). These worksheets were modified to fit the experience-based nature of this study instead of Stake's own program evaluation perspective. The list of themes was then compared to those existing in the academic literature on college student learning failure. From this comparison, assertions related to the research questions of the

study were developed. The additional themes and assertions generated by this analysis constituted the major contribution of this study.

Rigor and Trustworthiness

Specific strategies were used as suggested by Lincoln and Guba (1986) to ensure that the findings of this study were both rigorous and trustworthy. The criteria for judging rigor and trustworthiness suggested by these authors were credibility, transferability, dependability, triangulation and confirmability.

Credibility. To establish the credibility of the assertions that resulted from this study, five key strategies were used: prolonged engagement, persistent observation, progressive subjectivity checks via the practice of reflexive journal entries, triangulation by peer debriefing and member checks, and negative case analysis (Lincoln & Guba, 1986). Triangulation between participants and across cases also served to strengthen the credibility of the cases, the methods, and the findings of the study. Prolonged engagement occurred through multiple interviews with the final participants over a period of approximately six months. This engagement ensured both that the cases generated were sufficiently thick in their description and that themes were clearly understood from the emic perspective of the student. Persistent observation was achieved through in-depth interviews and analyses of the cases, with member checking ensuring the accuracy of the themes generated by the study. Peer debriefing was conducted throughout the study by having members of the committee review the developing findings. Member checks were conducted with participants beginning after the second interview and continuing after each successive interview throughout the study by soliciting feedback from participants about developing findings. Both the study participants and the committee were given ample time to review and reflect on the drafts as Stake (2010) suggests. Data triangulation was used to refine

and substantiate the assertions of this study by comparing and contrasting the multiple cases that were generated (Patton, 2001; Stake, 2006). Negative case analysis was conducted in conjunction with the previous two approaches to refine the assertions of the study by identifying competing themes in the cases. Throughout the study, the researcher maintained a reflective journal in which conclusions, insights, and themes from the study were recorded. As unique insights came forth through interviews with participants and analysis of the cases, they were entered into the reflective journal for further analysis and for reworking the recorded insights of the researcher (Denzin, 1970; Patton, 2002). These reflexive journal entries were also used for progressive subjectivity checks and to document the researchers developing understanding of study themes. Alternative understandings and themes were developed and shared regularly with participants and the researcher's committee to develop an accurate representation of the participant's emic perspective. This negative case analysis occurred throughout the study until the researcher determined that additional competing evidence was negligible or non-existent given the participant and his or her experiences with learning failure.

Transferability. To promote the transferability of the findings generated from this study, care was taken to develop thick, narrative cases in the participants' own words. This strategy enables other researchers to make "judgments about the degree of fit or similarity" to other contexts (Lincoln and Guba 1986, p.19).

Dependability and confirmability. To establish the dependability and confirmability of the findings of this study, an audit trail was maintained for the purpose of review at the conclusion of the study (p.19). Included in the audit trail were the reflexive journal entries, interview transcripts, Stake's cross-case analysis worksheets, and the results of peer reviews and member checks.

Positionality. The researcher is a PhD student studying Instructional Psychology and Technology at Brigham Young University. He has taught university courses in statistics, strategic planning, and technology integration for pre-service teachers. His research interests include generative approaches to instructional design and informal and self-evaluation. He has conducted a pilot study on learning failure experiences resulting from an undergraduate honors course that he co-designed with other BYU faculty. The pilot study revealed themes that contradicted findings in the literature about student fear of failure and typical attributions. Additionally, the pilot study served to refine questions in the interview protocol. From this experience, the researcher determined that quantitative research methods fail to identify the range of themes and complexities inherent in learning failure, thus oversimplifying the phenomenon. From a human agency standpoint, the quantitative methods used in previous studies on learning failure fail to account for the indeterminate nature of human decision-making, relying instead on probabilistic models of prediction and control of the failures. While there is value in these models, they also fail to account for the full complexity and themes of learning failure experiences. The researcher believed that only with a thorough documentation of this range of complexities and themes of learning failures could effective instructional interventions be developed to help students successfully resolve their failures.

Findings

The purpose of this study was to address the following two research questions:

1. How does a college student reflectively describe and explain his/her learning failures?
2. What are the important themes of learning failure experiences from a college student's perspective?

In order to address these questions, this section of the report first includes the narrative cases of two college students, Amy and Jason. The first two cases explore Amy's experience in a chemistry course and a statistics course. The last two cases explore Jason's experience in a chemistry course and an American Sign Language (ASL) course. The four narrative cases are presented separately, followed by their respective themes. Following the cases and their themes, the findings from three cross-case analyses are included: Amy's learning failures, Jason's learning failures, and Amy-Jason learning failure comparisons. The implications of these findings are explored in detail in the "Discussion" section of this report. Each case is shared in the participant's own words with minor formatting and punctuation added to improve readability.

Amy — Chemistry Learning Failures

Chemistry, I learned, was something that didn't come easily to me. So I tried it a few different times. I would start the course and then realized it was going to be too hard for my schedule and then drop it just before the add/drop deadline or the withdrawal deadline. So that was the first couple times I tried to start Chem 105. But then the third time I took it and kept through it and I didn't fail it. So that was good, but I didn't do amazing. I think that's part of me being a perfectionist and then using perfectionism as a way of procrastination and then just not doing something. With chemistry early on I remember the feeling that I had coming out of the testing center late at night, doing as much as I could, being kicked out of the testing center because it was closing, trying to fill in random bubbles and just the feeling of walking through campus thinking, "I shouldn't be here. I cannot do this. I'm not as good of a student as BYU deserves or as BYU requires." And so chemistry was one of the difficult classes for me. It was the basic one, I think. Not the most basic, but it should be the beginning one. That was a hard one. That's the one that I think I'm a little ashamed about it. Just because I started it maybe even

a couple of times and the third time I kept through it and still did not do very well. And I think in the beginning, the first time I started it I already started out being nervous about it because people told me it was a hard class. And for me, I already had this perspective of myself that "I'm not a very good student. I don't do well in hard classes" and that's what was going on. A part of it I think was that when something looked hard, I didn't feel like working on it because I knew I would fail in a sense. Or I knew I wouldn't be able to do as well as I wanted to and so it would be hard to get the motivation to actually do the homework.

Chem 105 is a huge class! And so there were multiple days when it's in one of those rooms that have the big stadium seating and it's got, probably 100 or at least 80 students in our class. And so all the seats would kind of fill up on the outsides and you wouldn't want to climb over a ton of people. And I would always be late. That was another bad thing on my part. I was always late, so I would always be sitting on the stairs along the sides. And I wasn't the only one. There was always a ton of students. So, being a little person over on the side of the stairs that walked in late, I would feel even worse about asking the teacher a question and making him go back. I was sitting in class listening intently and I still didn't understand it. I needed the teacher to go back to the very beginning and re-explain it in a different way. But all the students around me looked like they understood it. They were all asking these questions that apply to it and I felt like I wouldn't even know how to ask a question because I just didn't understand it. I would be in class and the teacher would just lose me in the beginning but then he would just keep going and I wouldn't want to make him go back. So many students looked like they were perfectly smart and I always had this bad perspective of myself where I felt like I was the only one who didn't understand and everyone's going to think I'm stupid if I make the teacher go all the way back. I don't know. And I think because of that perspective I had in the beginning it already

made me not want to really study which would have been the thing that would've helped me. If I had felt comfortable enough to go to the teacher and say, "I don't understand this. Can I meet with you?" Then, I would've been so much better! But, I just wasn't confident like that at all.

Eventually I realized that "I'll just going to keep going and it doesn't matter what people do or think or what they understand. I'm just going to make sure I can keep understanding this." So I think that I barely got by with the homework assignments because it was still just harder for me to understand. I think conceptually, trying to understand some of the things the teacher taught and trying to figure out in my mind was difficult. And sometimes books have different kinds of diagrams in them to try to explain one principle. For me when I have a lot of different diagrams it confuses me as opposed to if it just had one diagram that it would keep teaching from. I think they're all about something different and I can't picture it in my mind. Then trying to memorize all of the little molecules and then how you put them all together was hard for me. I think things got hard when he started to get into the basics of organic chemistry. Just trying to understand what the basic molecules were and how they would fit together, how that would change the polarity of the molecule and trying to understand what direction it would go in, etc. was hard. Because somehow when they combined, the shape of the molecule changed. Sometimes that was confusing to me, unless I had the little things that people put together. I never really played with those. I didn't go to lab very often. I went to the scheduled lab and talked to the TA and that helped. But the other stuff, like converting things and putting it together into a little math equation and trying to change things — that was easier for me to understand. I've talked to other people about this. I would tell them "This is my first chemistry class in college" and they would say, "Wait. You didn't take it in high school?" And I would say, "Well, I did physics in high

school." At my high school you could take one or the other for that requirement. Chemistry was just a little more conceptually harder to understand for me.

I think trying to understand how the molecules would react when you put them next to each other was hard. I know it kind of seems like it was a math problem. “When you put them together it should react this way, unless it's got a little tiny minus sign or unless it's shaped in a different way or if the polarity is different.” It just seemed like there were so many little details that would cause it to act in a certain way that it wasn't as easy in my mind as a 1 + 1 = 2 sort of thing. And it's interesting to me when I look at it. But I don't know. It just didn't come very easily to me. It could also be that I just didn't put in the time that it needed. I remember moles at first were a really hard concept for me to wrap my mind around, just because I didn't really understand that it was a form of measurement. It bothered me that it didn't fit with any other form of measurement that I had known before and that it was its own thing. You had to learn that from scratch again. You couldn't relate it to things as much. But once you got it down, everything else built on it. So you had to get that down. And I remember the first time I took chemistry, trying to understand moles didn't quite click, but I thought I would just keep going. And I couldn't really understand it — the whole concept of moles in the beginning. The second time I got it a little bit better. I think it took the TA helping me. I would go to lab even if I felt ridiculous asking again and making the TA explain it in a different way and actually reading every word in the book and not just skimming. So that's when I finally tried to get over my pride issues — having to ask yet again because I still didn't get it {…} But I think it was really just applying myself and having it explained to me in different ways and then reading it again from the book. I remember I had to have it explained and then I would say it back. If I said it wrong they would say "no, no, no" then they would explain it again in the same way. As long as I said it

back in the right way, that's when I thought, "Okay, I think I understand." The interaction helped a lot. And even if someone explained it again the third time, finally the first one clicked. For me it's just going through the grueling process of talking about it again and again and again and then finally I can understand it.

Isotopes, I think I started to get a little lost on and I don't remember exactly why because I don't remember what they are. Maybe isotopes were okay. I think once I got the idea of the initial atom down I thought "okay, so it's got a certain weight figure. Adding electrons here and here and changes the formation of it" and stuff like that. That's when I think I got it. It was confusing and it took a lot of work for me to realize what the polarity would be, "would it be a positive for a little negative sign?" With dimensional analysis I'm trying to remember what it is. If I just had a chemistry book I could kind of look at things. If it's anything like I remember, the teacher had this really good visual aid for understanding dimensions of different things. He had balloons that he would use to show that when you tighten the strings on any of these balloons they'll automatically go into a certain formation and that's how this kind of molecule would be. When you take off one part of the molecule then the balloons automatically shift and go into another type of dimension. It's like you pop a balloon and the balloons, you shake them and they automatically shifted to a new position and you would see the little formation they made. He said, "This is how it would be like this" and then he would continuously pop a balloon. I remember that was a really good way to finally figure it out. I had to really see it. So, I think dimensional analysis was a good one.

The wave and particle nature of light was hard the first time I remember, but the second time just hearing it again, it clicked a little bit more. The relationship of photon energy was the one I think was super hard. Just trying to figure out how the electrons jump from one level to the

next. Sometimes it was hard to figure out which level it was going to jump to. With frequency and wavelength for some reason I think I could understand the physics side of things a lot easier than the chemistry side. So wavelengths were fine because we were just measuring the actual wave instead of the photon and the nature of the photon. It depended on what it collided with, what molecules it collided with in order to figure out how it would act. But this was like it was already acting that way — with waves and frequencies you were just measuring how it was already acting. Forget about why it was acting that way or what's making it that way. I guess maybe I kept feeling like it was unpredictable. That's how it seemed. But I think what the teacher was probably trying to explain was that it is predictable and that there is a certain pattern — you just have to get it down. That was probably it. I couldn't really figure it out.

With hydrogen atom electron energies, energy states, and stuff it might have been ok. I think I remember the initial struggle of learning it and then it did eventually come but I don't think I ever felt like I had mastered it. So, there were some stages in between where I thought, "I can kind of understand this" because of my base with other things. With emission and absorption spectra I think some it was just trying to understand the little details and it's just hard to remember. But I remember that those details sometimes intimidated me too. Because for me, I see something and I think "that's too hard for me" — that's that initial thought. And then sometimes I don't want to learn the details — I don't bother to learn the details because I think, "that's beyond me." But I definitely could have if I had put in the time and the hard work and everything for it. Whenever I did finally understand it, it felt really good. So that might have been one of those things. The spectrum is where there's a whole range of all these different types of rays and stuff and I remember learning about them. Physics also helped solidify them in my mind. But, I don't remember.

I recognize all these names. I'm trying to remember the homework assignments. If I could just look through the book and flip through the pages I would be able to remember, "That was good" because I had been through that book — not completely because the chemistry book is like one hundred pounds. The funny thing is, I wanted to sell my book back and get a lot of my money back but I left it in the classroom one day and then it was gone. It was never turned into lost and found. So someone else sold it back and got my money. It was horrible. But it's okay. It all works out.

Amy — Chemistry Learning Failure Themes

The chemistry course that Amy took was Chem 105: General College Chemistry. The course introduces students to atomic and molecular structure including bonding and periodic properties of the elements; reaction energetics, electrochemistry, acids and bases, inorganic and organic chemistry (retrieved January 24, 2014 fromhttp://saas.byu.edu/catalog/2013-2014ucat/departments/Chemistry/ChemEducMinor.php). Amy took chemistry three times and never earned a passing grade. According to her interview, her two goals were to earn a passing grade and to master the course concepts. She struggled to understand course concepts, even after repeated course attempts. She also struggled to form strong social ties with the professor or her fellow students. The following major themes stood out in this case: Learning Failure, Self-doubt, Learning Strategies, Instructional Strategy, Social Anxiety, Effort Attribution, and Conceptual Framework.

Learning failure. Amy's original goal was to earn a high grade in the course. She stated that, "Chemistry I learned was something that didn't come easily to me. So I tried it a few different times… I would start the course and then realized it was going to be too hard for my schedule and then drop it just before the add/drop deadline or the withdrawal deadline. So that

was the first couple times I tried to start Chem 105. But then the third time I took it and kept through it and I didn't fail it." After her initial learning failure, her new goal was to avoid failing the course. Even though she stated that she passed the course the third time she took it, during member checks Amy disclosed that she never did pass the course.

Amy also wanted to understand the explanations of the instructor. She struggled to work through the "confusion" associated with the course concepts until they were no longer confusing. She wanted to master the course concepts, but failed to invest the time necessary to master them. In the interviews she stated, "I think conceptually, trying to understand some of the things the teacher taught and trying to figure it out in my mind was difficult. But I definitely could have if I had put in the time and the hard work and everything for it." These learning failures took place during the entire chemistry course.

Self-doubt. Amy remembered the feelings of self-doubt created by her poor testing experiences in the chemistry course. "With chemistry early on I remember the feeling that I had coming out of the testing center late at night, doing as much as I could, being kicked out of the testing center because it was closing, trying to fill in random bubbles and just the feeling of walking through campus thinking, 'I shouldn't be here. I cannot do this. I'm not as good of a student as BYU deserves or as BYU requires.'" This self-doubt then negatively impacted her engagement in the course. Amy stated that, "I think in the beginning, the first time I started it I already started out being nervous about it because people told me it was a hard class. And for me, I already had this perspective of myself that 'I'm not a very good student. I don't do well in hard classes' and that's what was going on. A part of it I think was that when something looked hard, I didn't feel like working on it because I knew I would fail in a sense. Or I knew I wouldn't be able to do as well as I wanted to and so it would be hard to get the motivation to actually do

the homework. So, Amy determined from her learning failures in her chemistry course that she wasn't as strong a learner as she thought she was. However, once she understood a concept, she had really positive feelings about the learning success, which counteracted some of the self-doubt. "Whenever I did finally understand it, it felt really good." So the self-doubt Amy experienced was mediated by her perceptions of success and failure in the course.

Learning strategies. Amy consistently showed up late for class, which contributed to her learning failure. She stated that, "I would always be late. That was another bad thing on my part. I was always late, so I would always be sitting on the stairs along the sides. And I wasn't the only one. There was always a ton of students. So, being a little person over on the side of the stairs that walked in late, I would feel even worse about asking the teacher a question and making him go back." Being late to class led to poor help-seeking strategies, which hampered Amy's ability to adequately learn the course concepts. She also struggled to spend the time necessary to learn the course concepts. She was not able to use her textbook effectively to study or to take effective notes in the course. These poor learning strategies significantly contributed to her learning failures in the course.

Instructional strategy. Amy remembered the good instructional strategies related to learning about dimensional analysis. When asked about her experience learning about dimensional analysis, she stated, "If it's anything like I remember, the teacher had this really good visual aid for understanding dimensions of different things. He had balloons that he would use to show that when you tighten the strings on any of these balloons they'll automatically go into a certain formation and that's how this kind of molecule would be. When you take off one part of the molecule then the balloons automatically shift and go into another type of dimension. It's like you pop a balloon and the balloons, you shake them and they automatically shifted to a

new position and you would see the little formation they made. He said, ‘this is how it would be like this’ and then he would continuously pop a balloon. I remember that was a really good way to finally figure it out. I had to really see it.” This experience really stood out to her. From the lack of detail about other learning experiences and her reportedly poor performance in the course, it was apparent that the instructional strategies for other topics were not as helpful to Amy.

Social anxiety. Amy’s learning failures in her chemistry course happened because she did not ask for the help she needed. She didn’t want to inconvenience the professor or the other students because she perceived that she was the only one struggling with the concepts. She stated, “I would feel even worse about asking the teacher a question and making him go back. I was sitting in class listening intently and I still didn’t understand it. I needed the teacher to go back to the very beginning and re-explain it in a different way. But all the students around me looked like they understood it. They were all asking these questions that apply to it and I felt like I wouldn’t even know how to ask a question because I just didn’t understand it. I would be in class and the teacher would just lose me in the beginning but then he would just keep going and I wouldn’t want to make him go back. So many students looked like they were perfectly smart and I always had this bad perspective of myself where I felt like I was the only one who didn’t understand and everyone’s going to think I’m stupid if I make the teacher go all the way back.” Amy felt inferior to the others in the course because of her learning failures and because of her perceptions of the relative successes of other students. She was unwilling to ask for the help she needed because she felt embarrassed by her lack of understanding. She also felt less prepared for the course because she did not take a chemistry class in high school like many of the other students. She explained how, “I’ve talked to other people about this. I would tell them ‘This is

my first chemistry class in college' and they would say, 'Wait. You didn't take it in high school?' And I would say, 'Well, I did physics in high school.' At my high school you could take one or the other for that requirement. Chemistry was just a little more conceptually harder to understand for me." Amy's social anxieties that arose from her comparisons between her preparation and that of the other students contributed to her learning failures in the course.

Effort attribution. Amy tried to learn the course concepts on her own, but what she needed was help from someone else. She shared how, "Eventually I realized that 'I'm just going to keep going and it doesn't matter what people do or think or what they understand. I'm just going to make sure I can keep understanding this.' So I think that I barely got by with the homework assignments because it was still just harder for me to understand." She expected to understand the course concepts easily and when she didn't, she attributed the learning failure to a lack of effort. She felt like she wasn't putting enough time into the course. She concluded that, "It just didn't come very easily to me. It could also be that I just didn't put in the time that it needed." Even with the time she did put in, Amy was not able to master the course concepts like she wanted to. She thought that she could just "keep going," putting more effort into the course even though she was not learning the concepts.

Conceptual framework. Amy expected the course concepts to follow predictable laws that would make sense within a framework. The apparent lack of "predictability" of the course concepts made her learning failure worse. She believed that there was a "right" way to understand the course concepts that continuously eluded her. She explained that, "I think things got hard when he started to get into the basics of organic chemistry. Just trying to understand what the basic molecules were and how they would fit together, how that would change the polarity of the molecule and trying to understand what direction it would go in, etc. was hard.

Because somehow when they combined, the shape of the molecule changed. Sometimes that was confusing to me, unless I had the little things that people put together. I never really played with those… It just seemed like there were so many little details that would cause it to act in a certain way that it wasn't as easy in my mind as a 1 + 1 = 2 sort of thing." She felt that the course concepts did not relate to anything that she was familiar with and so she struggled to reform her ways of thinking to accommodate the new ideas. She stated that, "It bothered me that it didn't fit with any other form of measurement that I had known before and that it was its own thing. You had to learn that from scratch again. You couldn't relate it to things as much… I guess maybe I kept feeling like it was unpredictable. That's how it seemed. But I think what the teacher was probably trying to explain was that it is predictable and that there is a certain pattern — you just have to get it down. That was probably it. I couldn't really figure it out." Amy had the beginnings of a conceptual framework for the course concepts because of previous experiences, but her framework was not sufficient to tie together all the concepts in a coherent way. She explained how, "I think I remember the initial struggle of learning it and then it did eventually come but I don't think I ever felt like I had mastered it. So, there were some stages in between where I thought, 'I can kind of understand this' because of my base with other things." She never did come away with an understanding of the course concepts and how they related to one another.

Amy — Statistics Learning Failures

I took Stat 121 after my mission, but every once in a while after my mission there was that one class that was difficult. And because I was focusing on the rest of my classes so much I kind of neglected the hard one. So, Stat 121 was the hard class. I think I hesitated and probably waited to do the homework for it until last. And then I ended up not always being able to always

do it because it was harder homework. So, I got done what I could. And I've seen this with myself whenever I do something that proves to be difficult for me, I hit this wall and I say, "Oh! I don't want to try this anymore!" And that's when I drop the class the first time. Or that's when I get really frustrated and kind of angry. Then there are other people there that say, "Come on! You've got to keep doing it!" or I have to take the class and so I have to learn it at some point and I keep forcing myself. And then I finally get past that and say, "Oh ok! This makes complete sense." You try other ways. You know? I remember I was always kind of behind. I didn't go to the lab very often and I just couldn't quite understand the concepts. So I if I did do the homework I did poorly on the homework. And then, I guess the second time I took it I really understood. Some of the concepts really clicked in my mind because I heard it a second time. So with that base of hearing it the first time and kind of starting and then hearing it again from someone else's mouth a different way, I thought "oh, that totally makes sense." And so, some of it was the concepts and other parts of it was just making sure I had time in my schedule and forcing myself to go to the lab. And not just the scheduled lab that you sign up for that you have to go to get the grade you for, but also the open lab. And I had to make sure that I went even if I didn't want to and that I needed to even if I didn't want to. That's when I forced myself and it became so easy. It was like stats was just wonderful. I actually went through a couple of semesters of training to be a TA for stats. And then I realized I couldn't fit it into my schedule, which is sad because I did training to become a stats TA. But I wasn't actually a stats TA. So, now I like stats because I understand it. I think part of it was just trying to organize it all in my mind. Because there's a bunch of different formulas for different situations and so it was trying to read the situation and understand which formula applied. That was something that I just could not figure out how to organize in my mind. And now I can read a problem and think, "Oh yeah! I need this formula or

this formula." And so I learned more how to write all over my formula sheet and my book and my notes and just be willing to make a mess out of it. But the more I write, the easier it comes to me. Or if I draw things — I have to be actively doing something with my hand. So rather than just typing out notes, I have a notebook. And actually, when I was a training to be a TA, I would go back and review my notes from when I was a student, and that would help me figure out how to teach it better. I think I combined in the same notebook my notes from the first time I took stats and the second time. So the first time, I would be falling asleep and it was so sad and then the second time I would have really good notes. So, when it clicked I could stay awake. The second time I took Stat 121 it just clicked and I got an A. It's just the basic stuff. It definitely wasn't a big confidence feeling going into that class. But, I did think, "Well, I do have to take this class for this or that, so we'll just see how it goes." I had an older sister that took statistics and she liked it. But, that was in high school, so it was probably really simplified. And I thought, "Well, I've got family who understands statistics. And I have an older brother who did a lot too. So, maybe it will work out." The first time it was like I just didn't get it and it all went over my head. There were proportions and trying to understand definitions. Because in stats it's not as much math as it is understanding definitions. And so, I think the hard thing the first time I went through the stats class is that the BYU stats particularly has its own kind of language for stats as opposed to the rest of the world. So they have their own terms I think that they use for certain things. And sometimes I would just randomly search for things on Wikipedia and it would be slightly different. I realized that I had to forget Wikipedia and studying things on my own and just focus on the BYU stats. I noticed that BYU has its own stats terms and that's one thing — learning the terms for certain things. I think part of it's hard because the concepts are hard. Statistical things aren't always easy for people to understand. I think there's a lot of trying to

understand these statistical procedures and how they apply to a real life setting. I think that's part of it. The second time I went through stats, I had a different teacher and different TA's. And that's another thing. I loved the TA that I had the second time. The first time he was a little confusing. The second time I think she was a lot more experienced. So she would watch our faces and when she could tell that we were still confused she would explain it in a different way, "What about this? Okay, what about this?" And so that was another nice thing — that she was willing to review it again and again until she could tell that we were understanding it. Like when the light came to our eyes. That was really helpful — TA's that I could talk to. Plus, I was in a tiny class that only consisted of three or four students. It was a special situation where we were on a stats portal for homework assignments as opposed to this "my-stats-lab-homework-thing" program that they were testing out with everyone else.

Amy — Statistics Learning Failure Themes

The statistics course that Amy took was STAT121: Principles of Statistics. The course introduces students to stem plots, boxplots, histograms, scatterplots; central tendency, variability; confidence intervals and hypothesis testing involving one and two means and proportions; contingency tables, and simple linear regression (retrieved January 24, 2014 from http://saas.byu.edu/catalog/2013-2014ucat/departments/Statistics/BiostatEmphasis.php).Amy failed to understand the course concepts the first time she took the statistics course. But the second time she took the course she began to understand the concepts. This case demonstrates Amy's experience with initial learning failures that she later resolved. The major themes that stood out in this case are: Learning Failure, Hard Concepts, Analyzing Problems, Study Strategies, Time Management, Confidence Issues, Social Dynamics, and Remediation

Learning Failure. Amy wanted to get an A grade in the course the first time that she took it but she quit because she couldn't understand the concepts and she did poorly on the homework. She explained that, "I've seen this with myself whenever I do something that proves to be difficult for me, I hit this wall and I say, "Oh! I don't want to try this anymore!" And that's when I drop the class the first time… I just couldn't quite understand the concepts. So I if I did do the homework I did poorly on the homework." Amy struggled to earn the grade she wanted primarily because she could not understand the course concepts and definitions. She stated how, "The first time it was like I just didn't get it and it all went over my head. There were proportions and trying to understand definitions. Because in stats it's not as much math as it is understanding definitions." By taking the course a second time, Amy was able to understand the course concepts, which led to the resolution of her previous learning failures in the course. This led her to become more engaged in the course. She shared that, "When it clicked I could stay awake. The second time I took Stats 121 it just clicked and I got an A."

Hard concepts. Amy failed to understand the definitions of the course concepts because they did not relate to her past experience with math and other concepts that she thought should be related. She also struggled to understand how the course concepts applied to real life. She stated how, "I think part of it's hard because the concepts are hard. Statistical things aren't always easy for people to understand. I think there's a lot of trying to understand these statistical procedures and how they apply to a real life setting. I think that's part of it." Additionally, Amy said she was confused by the difference between BYU definitions and definitions that she came across on the Internet. She shared that, "I think the hard thing the first time I went through the stats class is that the BYU stats particularly has its own kind of language for stats as opposed to the rest of the world. So they have their own terms I think that they use for certain things. And

sometimes I would just randomly search for things on Wikipedia and it would be slightly different. I realized that I had to forget Wikipedia and studying things on my own and just focus on the BYU stats. I noticed that BYU has its own stats terms and that's one thing — learning the terms for certain things." The concepts were difficult for Amy to understand because of multiple sources of information with apparently contradictory definitions. Eventually she was able to address the multiple information source problem by choosing to focus on mastering the BYU terms and definitions for the course.

Analyzing problems. Amy's lack of ability to analyze and understand the assignment problems contributed to her learning failure. She struggled to know which formulas to apply and when. She explained that, "I think part of it was just trying to organize it all in my mind. Because there's a bunch of different formulas for different situations and so it was trying to read the situation and understand which formula applied. That was something that I just could not figure out how to organize in my mind. And now I can read a problem and think "oh yeah! I need this formula or that formula." As her ability to understand and analyze problems improved, she was better able to apply the statistical formulas and correctly solve the problems.

Study strategies. Amy was able to resolve her learning failure by improving her study strategies. She began taking better notes and including more detail in the notes. She also made drawings for some of the assignment problems. She shared that, "I learned more how to write all over my formula sheet and my book and my notes and just be willing to make a mess out of it. But the more I write, the easier it comes to me. Or if I draw things — I have to be actively doing something with my hand. So rather than just typing out notes, I have a notebook." Later on, when she began training to be a TA for the course, these course notes were a large help to her again. She shared how, "Actually, when I was a training to be a TA, I would go back and review

my notes from when I was a student, and that would help me figure out how to teach it better. I think I combined in the same notebook my notes from the first time I took stats and the second time. So the first time, I would be falling asleep and it was so sad and then the second time I would have really good notes." So even though her first experience in the course was a failure, her notes continued to play a role in the improvement of her course study strategies.

Time management. Amy struggled to manage her time across her classes, which contributed to her learning failure. Because she believed that the Stat 121 course was difficult, she procrastinated and failed to put in the time necessary to understand the concepts. She shared how, "I think I hesitated and probably waited to do the homework for it until last. And then I ended up not always being able to always do it because it was harder homework. So, I got done what I could." However, when she put in the time to go to the labs, Amy was able to learn the material. She explained that, "Other parts of it was just making sure I had time in my schedule and forcing myself to go to the lab. And not just the scheduled lab that you sign up for that you have to go to get a grade for, but also the open lab. And I had to make sure that I went to that even if I didn't want to and that I needed to even if I didn't want to." By improving her time management across her course load, Amy was able to make the time necessary to learn the course concepts.

Confidence issues. Amy was not confident in her ability to understand the course content. She tried to build her confidence by relying on help from siblings who had already successfully taken statistics. She explained how, "It definitely wasn't a big confidence feeling going into that class. But, I did think, 'Well, I do have to take this class for this or that, so we'll just see how it goes.' I had an older sister that took statistics and she liked it. But, that was in high school, so it was probably really simplified. And I thought, 'Well, I've got family who

understands statistics. And I have an older brother who did a lot too. So, maybe it will work out.'" This lack of confidence hurt Amy the first time she took statistics as she got discouraged and failed the course. Fortunately, her successes the second time in the course led to an increase in her confidence and the desire to serve as a TA for the course.

Social dynamics. Amy's stronger relationships the second time she took the course contributed to her success. The class size was much smaller and she had a better experience with the TA. She shares that, "The second time I went through stats, I had a different teacher and different TA's. And that's another thing. I loved the TA that I had the second time. The first time he was a little confusing. The second time I think she was a lot more experienced. So she would watch our faces and when she could tell that we were still confused she would explain it in a different way, 'what about this? Okay, what about this?' And so that was another nice thing — that she was willing to review it again and again until she could tell that we were understanding it. Like when the light came to our eyes. That was really helpful — TA's that I could talk to. Plus, I was in a tiny class (the second time) that only consisted of three or four students. It was a special situation where we were on a stats portal for homework assignments as opposed to this 'my-stats-lab-homework-thing' program that they were testing out with everyone else. The key to these stronger relationships the second time in the course was Amy's comfort in asking for the help she needed. This was easier to do in a smaller class setting and with the experiences with already taking the course previously. Additionally, Amy persisted when she had others encouraging her to work through her learning failures. She shared how, "Then there are other people there that say, 'come on! You've got to keep doing it!' or I have to take the class and so I have to learn it at some point and I keep forcing myself." The social support Amy felt enabled her to push through the learning failures and eventually understand the difficult course concepts.

Remediation. Amy was able to resolve her learning failure the second time she took statistics because she was able to fill in the gaps in her understanding from the first time she took the course. She explained that, "With that base of hearing it the first time and kind of starting and then hearing it again from someone else's mouth a different way, I thought 'Oh, that totally makes sense.'" Although she categorized her first experience in the course as a learning failure, Amy did retain some of the concepts, which she was then able to build upon the second time she took the course. The key to the remediation was hearing different explanations of the same concepts from someone with a different perspective on the course concepts. Also, resolving her learning failures in the course the second time led Amy to pursue additional opportunities for learning statistics. She shared how, "It was like Stats was just wonderful. I actually went through a couple of semesters of training to be a TA for Stats. And then I realized I couldn't fit it into my schedule, which is sad because I did training to become a stats TA. But I wasn't actually a Stats TA. So, now I like stats because I understand it." The resolution of her learning failures in the course led to a change in attitude about the course. Amy's engagement with the course concepts increased so much that she desired to become a TA for the course.

Jason — Chemistry Learning Failures

For Chem 105, I took it from Macedony and he's a great teacher. He really cared about the education of students and he wasn't just throwing stuff out there trying to sound intelligent or anything. He is a great teacher and in the beginning he told us, "This is hard stuff. I'm not going to make it easy on you." And what I've seen of the Chem 105 professors, that holds true to the max. But he gave the resources to us and the TA's (he had great TA's) and I still just didn't do that well with it. I like dealing with science conceptually. I think I deal better with the bigger picture than I do with technical specifics. But, I don't really know what the teachers were

supposed to do about that because they can't just go through a lecture class that way. I don't know how they would do that. And I hadn't done chemistry since high school — probably my junior year, I'm guessing.

I'm horrible at math. Math is my worst subject ever and Chem 105 was one of my first science classes where I had the science and the math kind of coming together. At the beginning I did well then I kind of dropped off because I got focused on other classes and lost focus on Chemistry. And I did really poorly on some of the tests and stuff. Then I thought, "Oh my goodness. I need to bring this back up," like the typical student, right? So I went back into it, but for the final I was just trying to pull a C, like a high C or whatever. But instead, I had been studying like I had these finals back to back, like I had that one week where you can choose when you're going to take it and stuff. And I thought, "Well, I can take it" — I don't know why I thought this; "I'll take the hardest one last — Chem105." And so I burned myself out studying for those other classes. Some I did good on, some I didn't. Most I didn't do that hot on. It was like B's and high C's. I don't know. I don't know where the grade averages ended up at. But for Chem 105 I was totally burned out. And I just went into it in the testing center and just took it without studying. Worst idea ever! When you get in there you just had your multiple-choice with the bubbles and stuff, A through J. It was almost like every question was A through J, you know? You had that many options. So I thought, "Well, hmmm. I haven't put down Z in a while." So I just scribbled that one in, or whatever. So I felt like a D+ in it hit me pretty good.

I feel like it was because the beginning stuff was kind of foundational. There are actually two things. The beginning stuff was kind of foundational and so when I got into a little more advanced stuff it required that beginning stuff that I didn't really understand. I wasn't focusing on it as much and it kind of killed the rest because I hadn't taken the time to actually to relearn it.

I just kind of mashed into my brain to the point where I could say, “Okay, this is what I’m supposed to do here” and then build up to the next problem, the next kind of idea. There was that. I also remember specifically in Chem 105 there was a lot of memorization, like elements and formulas and all that stuff. And in memorizing that stuff, I didn’t really focus on that until the very last moment and I didn’t really get it. I just got it in there to the point where I felt like I was going to do well with it. If I had gotten it on like a small quiz I was going to study this one and this one and this one because these were probably going to be the most prominent. These were the most prominently used in class and stuff and so if I just learned those ones that I could kind of get by. I was trying to study for the test but not really learning it. That’s how it was I would say. I would say that’s accurate in most cases in most classes actually.

For me, going in to the labs wasn’t a really big help for me for me. I could go into the lab and follow directions and I could see a reaction happen but because I didn’t really understand the concepts of it, “how much of this stuff is part of this reaction,” I didn’t really know what I was talking about. The crossover from the knowledge and the stuff we were learning in class and getting my hands on it didn’t really happen. Because if I didn’t know the stuff from class I couldn’t really answer the questions in the labs. And when I see any kind of chemical, like vinegar and baking soda, when I see those two go together, like bases and acids, I don’t really think of it as “Oh! This is this reaction happening to the molecules and stuff.” I just don’t think that. “It’s getting foamy! It’s going to explode!” I just don’t think of it the other way. I see it just as a physical manifestation of something cool. I don’t think of the theory behind it. I wasn’t putting myself in the role. But I think it goes to an even deeper issue. With school in general there are classes and things that you don’t really want to take. I never had a desire to take Chem 105, but in my major at the time, exercise science, I had to take Chem 105. So when I think of

exercise science, I think of working on people. I think of working with joints and looking at an injury and trying to treat it or trying to help someone. But I don't see or I never had a desire to get how the molecules work — like what happens to baking soda and vinegar when they come together and explode. I didn't see the relevance of that. When the teacher, Macedony, would come out with a cool fact about the human body or whatever, "and this is why this happens," then I could see through the veil so to speak — between chemistry and exercise science. I could see that there was an actual application there like why electrolytes are needed in the human body, "because the salt does this." There's an application there, you know? And so I kind of perked up a little bit. But then, for most of the class, I just thought, "Ok. This is what radiation does."

The homework was good, the online stuff. It was a good program. Once I really started putting my head to it, I picked up more out of the homework than anything else. Which is funny because the teacher had a step process to it that he showed us in the beginning of class. You come, you read, and you study. You read through it and it's not just a quick scan. You really read it. And then you have questions. Then you have two opportunities to really get out your questions: a lecture and your section recitations. In lecture you go over general problems to rehash what you've read in general terms. Then you go to recitations. I can't remember if homework was due before recitations or sometime afterwards. I think it was afterwards. I think you had until the next lecture, but I'm not sure. So in recitations the teacher went a little deeper into what you needed to know. He talked to you in student-to-student terms. So you could get your questions out and get it all pounded into you again. And then you were supposed to do the homework and know what you were doing when you got to the homework. But I used the homework like a lot of kids do. I went through the homework and just bounced off the walls until I got in the right spot. And you had a certain number of tries for each problem. I don't

remember how it worked, but if you didn't get it right the first time, you got a little point deduction and you would just get points deducted until they were forced to give you the right answer. And there were some frustrations with it. But in general, I really started paying attention in class and reading when I could, and really trying to stay awake in recitations and learn how to do it right and take notes on it. I think a big thing was really just taking my own notes personally and looking back on those when I was doing my homework. Then I really started doing well on the homework. So that helped me a lot. But in the big lecture class, I was going to make sure that my questions had some punch — that they were good questions. I wasn't going to be throwing out any dumb ones and have everyone or the teacher make fun of me at my expense. The teacher would joke around and stuff, but I didn't even ask a question, I don't think. I don't know. I don't remember. So recitation was the time to do it because everything that I ever asked or had a question about would be basic enough for him to answer. Plus, it was usually stuff that he had just said or stuff that you were already supposed to know. So it was a lot easier to go student to student without the TA saying, "why the heck haven't you been doing your studying." I mean, they might say that, but it would be taken with a lot less of a punch to the gut than from another student.

So I switched to another major so I wouldn't have to take it again. It was horrible. But it wasn't just the Chem 105 itself, it was the fact that I didn't feel like I could push myself through the math. I didn't feel like I could. The only help I gave myself in getting through math courses at the college level is that if I found something that I loved enough — the idea of doing something in the future that would push me through all the crud. You know? And so I didn't feel like becoming a PT or some kind of doctor or someone in the medical field. I didn't feel excited enough about that to say, "Yeah. I'm going to go through this no matter what." With science,

especially in the general science, there are so many weird rules. Science is just weird. Weird things happen - weird reactions, "When you add this element to this element you get this massive reaction" or whatever. "But when you add 'this' element to 'this' element it doesn't work the same as these two down here. It comes out to something completely different" and you're supposed to apply the math in a completely different way. And just that constant flux of rules and how you're supposed to deal with all these different things just kind of got to me I guess. That's why it happened so much. It was just keeping it straight in my mind that didn't work out and I wasn't patient enough to write it out, double-check it, or whatever. Chem 105 built on a foundation, there was lots of memorization and if you didn't give yourself enough time, then 'never again' - you never want to do Chem 105 again. But, I kind of wish I hadn't just switched out of the major just like that. But, at the same time I think it's a difficult thing because you don't know if there is actual application. I believe they must be having you take it for a reason. That's kind of in the back of your mind. Or, "Is this what I'm doing for exercise science?" Honestly, there might be some application and stuff, but I thought about it more and concluded that I should have looked through the major more. It was a lot more involved in physics than I was originally expecting. It's just frustrating. I kind of don't regret changing out of the major. I don't really know if that's just because of the chemistry classes because it was also kind of PDBio at the same time. But I'm sure that it's difficult. Chemistry is definitely one of the harder ones for me. Looking back, I think it was a good thing to go through and I'm still going around the track.

In my Chem105 class, the teacher created a system where you were doing your own work and you had an opportunity to learn and get some things wrong sometimes. But, you weren't going to get the right answer, for the most part, if you didn't know what was going on in the problem. And usually you had lots of choices on Chem 105 tests, like A through J. So it was like

this drawing of the potassium pump again. It was a drawing of these two lines going across and you have this tube thing and this molecule thing going in and out of it. And I'm thinking, "How?"

So, there were some concepts in Chem 105 that I struggled with more than others. Like with isotopes, atomic numbers, and atomic weight, the basics of it were pretty easy to understand but then it just got difficult. I remember isotopes being difficult. Dealing with isotopes and equations was hard. With the idea of moles, it took some time to get used to doing the math with going between moles and other units and conversion. But at the end I felt like I was getting pretty adept at converting and understanding what a mole was and how a mole of one element and a mole of another element didn't necessarily mean that they were equal. I mean, I understood that they were the same. It was a mole, but it could be different in weight. It was just different amounts of the substance. So I just feel like over the course of the term I got good at it. But the thing is, since I didn't get it at the beginning when I needed to know it I didn't do so hot in the middle parts — in the other subjects when I still needed it. But by the end, it was enough trial and error and they explained it enough in class. The TA would put up a problem about moles and I would be in the back just doing my thing saying, "Oh please, oh please, oh please" and I would be writing it down. Then I would come up with some number and the TA would have a student go up and they would work out the problem in front of you. So there were a lot of smart kids in the class who were really on top of it and once they went through it, I could kind of see where I went off from them or when I did the same thing as them and tried to get the right answer. And if we both got it wrong then the TA would say, "Here's what you did wrong with the moles here. You didn't convert it right here." That was in class. It wasn't the lecture. But it was the TA in the small class setting, the recitations. It was just something that took time. Because with chemistry

you work numbers in so many different ways. And throwing this element in or the type of reaction that you have going on changes up everything you do about the problem. So for me it was really hard to adapt. I mean it was coming at me so fast that I felt like I couldn't get how to work the numbers because I was always changing the numbers and how I worked with them. So there was a train wreck in the middle. I started working with moles and I thought, "I kind of get this" but then I turned my attention away from it instead of really going through the work again to try to really cement it in my mind. So then I started to study other stuff and other stuff got in my mind. So it was like a train wreck. It did get cemented over time, eventually. And at the end I felt like I could kind of work with the moles, but not if we were going to add other subjects into working with the moles. But moles themselves, I feel I understood them at the time.

With units of measurement I felt like it was a simple enough topic. I felt like, "Yeah, I got this —scientific notation and units of measurement, putting them after the numbers." I'm really trying to think about how I thought about it at the time. I just feel like it was something that was really easy that somehow got way too complex. Converting moles was also part of the same class. Scientific notation was something that seemed like it should be really simple but everybody just didn't do well at it. I know I wasn't the only one in class that wasn't doing so hot at it because we had several people that had to go up and do the scientific notation for these huge numbers and we got them wrong fairly consistently. Then the TA would explain and we thought, "Oh!" And then the next class period, I remember Macedony was saying, "This gets a lot of people." I remember him saying that and it really does. It got me plenty of times and it got everybody else too —moving the decimal point.

With the wave and particle natures of light, that's actually something that I remember from high school. So I understood that light could be seen as either a wave or a particle. But I

don't really remember much about photons. I kind of remember types of light, like red light or yellow light. With frequency and wavelength, I remember that stuff, calculating the top of the graphs, the arches, and stuff like that — but vaguely. But, I feel like that wasn't as difficult as the rest of it was. With electron energies I feel like it was just one of those things because I don't really remember it that well. I think I struggled with something about electrons and photons and neutrons. I don't remember.

Orbital shapes and energies was one of the topics that at first made a lot of sense to me, but I didn't know what they were for or what they were. So when I had to do something for a problem and I knew they were asking for what shape would they make, in the beginning I could get it but then in the long run I got confused again. I think it was in the more complex models or the more complex shapes where I thought, "I don't know what's going on here." When they were asking about this compound, this molecule, what shape it would make. I felt like if it was simple enough I could get it, but if wasn't I couldn't. I also tried to remember the D3, the F4, or whatever trying to go down the chart and finding out which molecule it could be. Quantum numbers were difficult for me. I can't remember anything about this stuff. When you were adding elements together, it would jump to a higher energy level and stuff, maybe. I don't know. If that's what it was, then I remember that if you were trying to find an energy level of the different elements and everything, the elements shoved together. Then you were trying to find what the final energy state would be. I could never figure that out. I never understood that one. I wasn't sure if it was supposed to be the energy levels added on top of each other or if they were subtracted from each other or if it was between the two energy levels or something. I just never understood the electron and its states. I think I'm getting topics mixed up here too. I definitely did not try to retain this stuff.

With writing electron configurations of atoms and ions all I can remember is having an element and saying plus two or minus one. I don't know. I don't really remember anything being hard really. With paramagnetism I don't remember anything. With periodic table and electron trends, meaning like ionization energy, electron affinity, electronegativity, atomic size, ionic size I feel like I did alright with that too. I feel like this is about the time where I was really getting back into the swing of things, trying to study harder what I was doing. So these things are a lot more familiar to me than the previous stuff that we talked about. So this might have been more of when I started more on the up slope.

With valence electrons, Lewis symbols of atoms and shielding, I don't remember shielding that well. I think I felt good about valence. Lewis symbols — I don't remember what those are. I just don't remember them. I think those are the dot diagrams. I did pretty good with those generally. With atomic reactivity and families of elements I think it was when you were supposed to put two elements together or this element was supposed to be more reactive than another. Yeah. That was pretty simple, because it kind of went back to families, right? With ionic compounds, how and why ionic compounds form, chemical reactivity, the octet rule, families of elements, polyatomic ions, ionic compound names and formulas, naming ions, hydrated compounds, and formula weights —this is where we get a bit nasty. I had both good and bad with those. Measuring weights was on and off. It was just all over the place because I feel like this was where we were really getting involved with a lot of different ideas being mashed together. If I didn't understand one then it would affect how I got the answer on another.

Naming ionic compounds. Honestly, ions usually gave me a lot of trouble in formulas and especially in compounds, like compound mixtures and stuff. There were some problems that asked how many ions do you have with the end result here and I would just spit something out. I

would try to put some reasoning behind it but it was not anywhere close. I was really off. I went back and forth because that was where I felt a lot of the knowledge was really being drawn together. The octet rule was one I remember it being simple in the beginning but then it got more complex. So when you are supposed to count how many electrons obviously you had more than eight, but I don't know. Maybe I would get so focused on a problem that I would forget there was this octet rule and I would miscount or not put down what was supposed to be there. I think because I didn't do well with the studying of it generally, that one part was ok but for the other parts, I just didn't really bother to try for retention. My retention was just really bad because I can't really remember it now.

For covalent bonds I remember single, double, and triple and a single bond as two electrons. When I was trying to figure out how many atoms I tried to draw it out. Drawing it out was kind of fun compared to the rest of the material depending on how hard it was. I felt pretty good about bonds but I remember struggling with one thing about bonds. One thing I struggled with bonds was when you have these different elements coming together, these different compounds in a molecule and you're supposed to draw out the molecule. Somehow I'd always get a different drawn molecule than what they would put up, even though it had the same, what is it? Formula? It was specifically with nitrogen, like N-O-3 or something, nitrate. I would somehow write it out or I thought it had potassium in it or something. It was nitrogen, phosphate, or man! It was N and P in an equation or formula and I was supposed to draw out the molecule and what it would be. Somehow I would end up with the right amount of molecules and elements in the molecule and everything, but somehow I was wrong. Does that make sense? Even though it looked the same — it was the same — it was right by the numbers and letters. I never did understand why that was wrong — why this was wrong and this was right. At the time I felt like

there was an easy difference. I really don't remember it though. I know that you write out like H-2-O and the other one. Actually, I don't think it was the actual molecule. I don't remember what it was, but it was something, you know? There was a difference between the two that was easy to tell.

I hated molar mass. That was one of the simple in the beginning, hard in the end. When you had to find the molar mass of a reaction, finding it in the beginning — or before the reaction and after the reaction it was just, "What?" you know? You had to know the number difference how to tell what kind of reaction you had by the difference in molecular mass, or if you even had a reaction. And for some reason I could just never come out right with it. I think I had problems with the conversion. I was still developing and working with the moles. So I got the conversions down and sometimes would get it right. Then other times I just thought, "No, no, no."

With resonance and exceptional structures I don't remember them at all. With bond polarity and molecular polarity, what I remember is if you have a triple bond in the molecule the other bonds are going to stand up straight away. It kind of goes back to the shape of the molecule. I understood that. It got confusing some of the time just because we were supposed to know the names of the shapes, like tetrahedral. I think that kind of got complex. You could come out with the right answer but then you would name it wrong and then get it all wrong. So, you would know the shape, but not the name and that was frustrating. And I remember there were two separate ways to name. It was this kind of bond structure and this kind of molecular structure and you had similar names within the bond and the molecular structures. You could get so confused if it was tetrahedral over here but it wasn't a tetrahedral in the molecular structure over there. A linear and a linear — those are pretty easy molecules. And if you had two molecules and they were kind of linear and then you add a third out here that was a 45-degree angle, you were

supposed to name that like a saw-bond structure. And then its molecular structure, it was linear, even though it wasn't. I don't know. It was stuff like that. That's not a good example, but there were similar names that got confusing like that. Just keeping the names straight was crazy. But besides that, I felt like it was pretty basic stuff. What they would do is they would give you the formula and you would have to draw the picture and then, "Hmm. I've got that bond here. This is going to make this kind of structure." So if you got that right, you would usually know the shape and be able to get at least one of the names right, if you'd keep it straight. But, it was just getting the names straight on that one I feel like was the harder part of that.

I remember I had a hard time with hybridization. I think that was kind of a harder topic. That's all I can say on that one. With double and triple bonding, I've heard the words, but I don't remember them. Conversion was one of the most difficult topics in the class, I would say. Like dealing with the notation, the scientific notation, going between nanoseconds and microseconds. I think the orbital shapes really stood out to me, you know? Orbital shapes are just kind of weird to me. Doing the reactions was hard, like knowing the reactions with hydrations and finding out the atomic masses — specifically the molar mass stuff and the reactions at the end. So, conversion was pretty difficult. Orbital shapes was easy, but then it got harder because I think the application of it later was just weird. I don't know.

In chemistry I don't know that there were clubs and groups to connect with. There might have been one or two that were passing through but definitely nothing that caught my eye. So I was PA or PT basically. I made connections and contacts with classmates in more of a social way. And it's funny because in my ward there was a girl that was actually in that class and I was talking to her the other day and she was saying the exact same thing. She changed majors because of the class too. She had the same exact experience that I did — same teacher. She was

in the same section, the same group. She was in my section and when we started talking about it, we were right on with each other. We knew exactly what each other were talking about. I think a big part of it was that we both didn't put in the time when it was really necessary to get the basic fundamental things down the beginning. One thing that was different between us is that she said she pretty much didn't understand what was going on the whole time. I think that's pretty common. There are males and females — this may or may not be true, but I feel like guys think, "I understand this, but I don't understand this." It's pretty cut and dry. But in conversation, a lot of girls say, "I had no clue about a single thing that was going on." They kind of look at the big picture and say, "None of that made sense." And so that was one thing that was different. But, she kind of evened out and did better than I did in the class because she studied for the final and she did the small things and did the homework and double-checked. We had the same level of patience and we always ended up with similar answers, but we didn't understand why they were right or wrong. Does that make sense? And we were so confused or we were just so frustrated or just the combination of all of the feelings that we were feeling that we made changes to our life's direction because of the feelings that came up — that frustration and lack of knowing what was up, that lack of knowledge. Macedony himself, tried to really put out opportunities for us. He didn't try to turn us down from seeing the professor and stuff and they need to be like that. But then there's the fact that students aren't really comfortable doing that or they don't feel like it's a high enough priority to go talk to them. I've just never really been one of those kids myself. But, I do remember him talking about going to a freshman 'Intro-to-College' class, "This is what you need to do." Well, it was kind of like a single lecture, a lecture series or something. Day after day, you could show up and he would tell you exactly how you needed to study as a freshman. These are the habits that you need to develop as you're here. And he would say, "This is what

you need to do. This will help you study for this class. It's very difficult. This is a difficult class." And so, he actually put up those opportunities. But I thought, "I'm not a freshman, I'm post-mission and I know what's up." I just got wrapped up in my own head about that.

I don't have a chemistry book anymore because I had the online version. I don't know why I did that. It was handy I thought. There's really trade-offs between electronic and the physical copy. I probably should have done a physical copy because I think it would have been easier to look at something on the computer than look at the book. I think it could have been better sell back wise. That's usually what I think of now is sell back price. Sometimes I would read the book and sometimes I wouldn't. It was weird.

Jason — Chemistry Learning Failure Themes

The chemistry course that Jason took was Chem 105: General College Chemistry. The course introduces students to atomic and molecular structure including bonding and periodic properties of the elements; reaction energetics, electrochemistry, acids and bases, inorganic and organic chemistry (retrieved January 24, 2014 from http://saas.byu.edu/catalog/2013-2014ucat/departments/Chemistry/ChemEducMinor.php). Jason took Chem 105 as part of the Exercise Science major to become a PA. He quickly realized that the course topics did not align with what he thought a PA did professionally. There were several learning failures within the course that were never resolved and led to him changing his major later on to Communications. The following major themes stood out in this case: Learning Failure, Career Application, Conceptual Difficulty, Poor Analysis, Self-awareness, Effort Attribution, Learning Strategies, Social Anxiety, and Homework.

Learning failure. Jason's goal was to earn passing grades on the tests and in the course as well as understand the course concepts. He failed to accomplish these goals and so he shifted

them because his learning failures went unresolved. He explained that, “I did really poorly on some of the tests and stuff. Then I thought, ‘Oh my goodness. I need to bring this back up,’ like the typical student, right? So I went back into it, but for the final I was just trying to pull a C, like a high C or whatever. But instead, I had been studying like I had these finals back to back, like I had that one week where you can choose when you’re going to take it and stuff. And I thought, ‘Well, I can take it’ — I don’t know why I thought this, ‘I’ll take the hardest one last. Chem 105.’ And so I burned myself out studying for those other classes. Some I did good on, some I didn’t. Most I didn’t do that hot on. It was like B’s and high C’s. I don’t know. I don’t know where the grade averages ended up at… So I felt like a D+ in it hit me pretty good.” Even though his study habits were poor, Jason was still surprised and disappointed with the grades on his exams and for the course.

Career application. Jason struggled to apply the course concepts to real life, specifically to future career activities. He didn’t have an accurate concept of what his professional activities would be like as a PA/PT. Jason had expectations of what a PA/PT does and the course concepts didn’t relate well to those expected activities. This drove Jason to change his expectations of what a PA/PT does, which led him to conclude that he didn't want to do be one anymore. He explained how, “I never had a desire to take Chem 105, but in my major at the time, Exercise Science, I had to take Chem 105. So when I think of exercise science, I think of working on people. I think of working with joints and looking at an injury and trying to treat it or trying to help someone. But I don’t see or I never had a desire to get how the molecules work — like what happens to baking soda and vinegar when they come together and explode. I didn’t see the relevance of that. When the teacher, Macedony, would come out with a cool fact about the human body or whatever, ‘and this is why this happens’, then I could see through the veil so to

speak — between chemistry and exercise science. I could see that there was an actual application there like why electrolytes are needed in the human body, 'because the salt does this.' There's an application there, you know? And so I kind of perked up a little bit." The times when Jason could make connections between his perception of future career activities and course concepts were the times that he was engaged and motivated to learn, despite the difficulty. Additionally he shared that, "The only help I gave myself in getting through math courses at the college level is that if I found something that I loved enough — the idea of doing something in the future that would push me through all the crud. You know? And so I didn't feel like becoming a PT or some kind of doctor or someone in the medical field. I didn't feel excited enough about that to say, 'Yeah. I'm going to go through this no matter what.'" Part of Jason's learning failure in the chemistry course was the refinement of his expectations for future career activities as a PA/PT. As he continued to learn more about what it takes to be a PA/PT, he realized that he was not interested anymore and chose to shift his learning goals accordingly.

Another complexity related to future career activities was that Jason had no role model or mentor helping him to make sense of the chemistry experience in relation to his goal to become a PA/PT. Looking back, he explained, "I kind of wish I hadn't just switched out of the major just like that. But, at the same time I think it's a difficult thing because you don't know if there is actual application. I believe they must be having you take it for a reason. That's kind of in the back of your mind. Or, 'is this what I'm doing for exercise science?'. Honestly, there might be some application and stuff but I thought about it more and concluded that I should have looked through the major more. It was a lot more involved in physics than I was originally expecting. It's just frustrating. I kind of don't regret changing out of the major." Had Jason been able to work with a mentor to give him perspective on what his major requirements would be and how

they related to his expectations of future career activities, he may have chosen to resolve the learning failures in the chemistry course instead of switching out of the major and avoiding them.

Conceptual difficulty. Jason's failure to learn concepts early in the course led to greater difficulty with later concepts. He shared how, "I feel like it was because the beginning stuff was kind of foundational. There are actually two things. The beginning stuff was kind of foundational and so when I got into a little more advanced stuff it required that beginning stuff that I didn't really understand. I wasn't focusing on it as much and it kind of killed the rest because I hadn't taken the time to actually to relearn it." In general, Jason struggled conceptually with scientific ideas. He lacked an overall framework for understanding the ideas as they related to one another and as they related to the physical world. His understanding of scientific principles came from trial and error and inconsistent feedback from peers and instructors. Jason shared that, "With science, especially in the general science, there are so many weird rules. Science is just weird. Weird things happen - weird reactions, 'When you add this element to this element you get this massive reaction' or whatever. 'But when you add *this* element to *this* element it doesn't work the same as these two down here. It comes out to something completely different' and you're supposed to apply the math in a completely different way. And just that constant flux of rules and how you're supposed to deal with all these different things just kind of got to me I guess. That's why it happened so much." His difficulty keeping the concepts and their relationships straight made it difficult for Jason to succeed in the course. Additionally, he would begin to understand a concept, but then a nuance or complexity was introduced and his entire understanding was destroyed. Reflecting on the concept of moles in the course, Jason explained that, "At the end I felt like I could kind of work with the moles, but not if we were going to add other subjects into working with the moles. But moles themselves, I feel I understood them at the

time." The progressive complexity of the course concepts constantly hindered Jason's ability to learn them. He did not make the time he needed to understand the basic concepts and so he struggled through the course. He also struggled to see the relationships between the concepts covered in the lectures and the experiments done in the lab section. He shared, "Because I didn't really understand the concepts of it, 'how much of this stuff is part of this reaction,' I didn't really know what I was talking about. The crossover from the knowledge and the stuff we were learning in class and getting my hands on it didn't really happen. Because if I didn't know the stuff from class I couldn't really answer the questions in the labs. And when I see any kind of chemical, like vinegar and baking soda, when I see those two go together, like bases and acids, I don't really think of it as 'oh! This is this reaction happening to the molecules and stuff.' I just don't think that. 'It's getting foamy! It's going to explode!' I just don't think of it the other way. I see it just as a physical manifestation of something cool. I don't think of the theory behind it." This lack of conceptual understanding and uncritical approach to the lab experiments were major contributors to Jason's learning failures in the course.

Poor analysis. Jason was not able to properly analyze his learning failures; they remained a mystery to him. He could not understand why he failed to understand the course concepts. He remembered parts of the concepts but was unable to identify the ideas that didn't make sense to him. In reflecting on electron energy states he explained that, "If that's what it was, then I remember that if you were trying to find an energy level of the different elements and everything, the elements shoved together. Then you were trying to find what the final energy state would be. I could never figure that out. I never understood that one. I wasn't sure if it was supposed to be the energy levels added on top of each other or if they were subtracted from each other or if it was between the two energy levels or something. I just never understood the

electron and its states." Sometimes Jason would think an idea was correct only to find out his understanding was flawed. This unresolvable learning failure frustrated Jason. With his experience trying to understand molecular bonds, Jason shared how, "One thing I struggled with bonds was when you have these different elements coming together, these different compounds in a molecule and you're supposed to draw out the molecule. Somehow I'd always get a different drawn molecule than what they would put up, even though it had the same, what is it? Formula? It was specifically with nitrogen, like N-O-3 or something, nitrate. I would somehow write it out or I thought it had potassium in it or something. It was nitrogen, phosphate, or man! It was N and P in an equation or formula and I was supposed to draw out the molecule and what it would be. Somehow I would end up with the right amount of molecules and elements in the molecule and everything, but somehow I was wrong. Does that make sense? Even though it looked the same — it was the same — it was right by the numbers and letters. I never did understand why that was wrong — why this was wrong and this was right. At the time I felt like there was an easy difference. I really don't remember it though. I know that you write out like H-2-O and the other one. Actually, I don't think it was the actual molecule. I don't remember what it was, but it was something." He struggled to understand the course concepts, but he also struggled to identify what it was that he didn't understand about the concepts. Jason struggled to metacognitively evaluate his experiences and identify his errors. When Jason did attempt to analyze his failures his reasoning was vague and inconclusive. He explained that when working to learn about ionic compounds, "I would try to put some reasoning behind it but it was not anywhere close. I was really off." This lack of evaluation significantly contributed to Jason's learning failures in the course.

Self-awareness. Through his learning failures in the chemistry course, Jason learned about his strengths and weaknesses, as well as his academic preferences. He realized that he did not enjoy chemistry or math. Looking back on the experience he explained that, "I like dealing with science conceptually. I think I deal better with the bigger picture than I do with technical specifics… I'm horrible at math. Math is my worst subject ever and Chem 105 was one of my first science classes where I had the science and the math kind of coming together." Although aware of the math anxiety at the outset of the course, it appears that Jason was not aware of his aversion to formal science courses until after his learning failures in the chemistry course.

Effort attribution. Jason cited lack of effort, rather than lack of ability for his learning failures. He believed he could have succeed in the course had he made the effort (i.e. put in the time). In reflecting on the opportunities for extra help in the course Jason explained that, "Macedony himself, tried to really put out opportunities for us. He didn't try to turn us down from seeing the professor and stuff and they need to be like that. But then there's the fact that students aren't really comfortable doing that or they don't feel like it's a high enough priority to go talk to them. I've just never really been one of those kids myself." Jason did not make the effort to take advantage of the learning opportunities offered by the instructor. Furthermore, Jason did not hold the teacher responsible for his learning failures. He explained that his learning failures were due to his own shortcomings. In speaking of his course instructor, Jason shared how, "He really cared about the education of students and he wasn't just throwing stuff out there trying to sound intelligent or anything. He is a great teacher and in the beginning he told us, 'this is hard stuff. I'm not going to make it easy on you.'" By attributing his failure to a lack of effort, Jason avoided the social shame that may come from admitting a lack of ability.

Learning strategies. Jason struggled to learn the course concepts because he struggled to know how to learn them. He attended lectures, labs, and recitations, and still he continued to experience learning failures. He guessed at the answers on the homework because he didn't understand the concepts. In reflecting on his experiences doing the homework for the course, Jason shared that, "I used the homework like a lot of kids do. I went through the homework and just bounced off the walls until I got in the right spot. And you had a certain number of tries for each problem. I don't remember how it worked, but if you didn't get it right the first time, you got a little point deduction and you would just get points deducted until they were forced to give you the right answer." Without understanding the course concepts, Jason would just guess at the answers on the homework until he got the right one. He did not go back to the homework problems to understand why he got them wrong or to work at learning the course concepts more completely. Jason also admitted that his goal was not retention of the course concepts. He explained how, "I was trying to study for the test but not really learning it. That's how it was I would say. I would say that's accurate in most cases in most classes actually… I think I'm getting topics mixed up here too. I definitely did not try to retain this stuff." When studying for exams in the course, Jason shared how, "I just kind of mashed into my brain to the point where I could say, 'Okay, this is what I'm supposed to do here' and then build up to the next problem, the next kind of idea. There was that. I also remember specifically in Chem 105 there was a lot of memorization, like elements and formulas and all that stuff. And in memorizing that stuff, I didn't really focus on that until the very last moment and I didn't really get it." Jason was not learning or memorizing the course concepts and definitions effectively. These poor learning strategies contributed to his learning failure in the course.

Social anxiety. Jason's fear of social embarrassment kept him from asking questions and getting help in class. He was hesitant to ask questions in front of classmates that might be considered too basic or irrelevant. He shared how, "But in the big lecture class, I was going to make sure that my questions had some punch — that they were good questions. I wasn't going to be throwing out any dumb ones and have everyone or the teacher make fun of me at my expense. The teacher would joke around and stuff, but I didn't even ask a question, I don't think. I don't know." So instead of asking questions to clarify and refine his understanding, Jason tried to resolve his learning failures by watching what other students did. In speaking of his experience with a board problem in the recitations portion of the class, Jason explained how, "the TA would have a student go up and they would work out the problem in front of you. So there were a lot of smart kids in the class who were really on top of it and once they went through it, I could kind of see where I went off from them or when I did the same thing as them and tried to get the right answer." This reliance on watching others resolve their learning failures was socially advantageous in that it allowed Jason to avoid embarrassment. However, it also prevented him from being able to get specific help with concepts he personally did not understand.

Additionally, Jason justified his learning failures because of other students' failures in the course. In an experience with scientific notation, Jason explained how, "Everybody just didn't do well at it. I know I wasn't the only one in class that wasn't doing so hot at it because we had several people that had to go up and do the scientific notation for these huge numbers and we got them wrong fairly consistently. Then the TA would explain and we thought 'oh!' And then the next class period, I remember Macedony was saying, 'This gets a lot of people.' I remember him saying that and it really does. It got me plenty of times and it got everybody else too." Due to the fact that the concept of scientific notation was difficult for a lot of students, Jason felt justified

that he was failing to understand it also. In reflecting on his learning failures in the course, Jason was also able to justify his outcomes based on the learning failures of another student in the course. He explained how this other student, "Changed majors because of the class too. She had the same exact experience that I did — same teacher. She was in the same section, the same group. She was in my section and when we started talking about it, we were right on with each other. We knew exactly what each other were talking about. I think a big part of it was that we both didn't put in the time when it was really necessary to get the basic fundamental things down the beginning… And we were so confused or we were just so frustrated or just the combination of all of the feelings that we were feeling that we made changes to our life's direction because of the feelings that came up — that frustration and lack of knowing what was up, that lack of knowledge." Finding others who experienced similar learning failures in the course helped Jason to justify his own learning failures, as well as his decision not to resolve them.

Homework. Jason had difficulty with the course structure because it did not allow for "learning by guessing." He explained how, "In my Chem 105 class, the teacher created a system where you were doing your own work and you had an opportunity to learn and get some things wrong sometimes. But, you weren't going to get the right answer, for the most part, if you didn't know what was going on in the problem. And usually you had lots of choices on Chem 105 tests, like A through J." He struggled with the course concepts and the course assignments reinforced those difficulties because there was no opportunity for remediation. Although he could use guessing to complete the assignments, Jason wasn't able to understand why the answers were wrong.

Jason — ASL Learning Failures

ASL just came to my mind right now. I actually really enjoy sign language. I really wanted to learn ASL before because I thought that it was really neat that a deaf person could talk to another person about complex ideas just like another person can. But they don't even have to say a single word. It's just all about facial expression and hands. You could be talking to someone and if they can see your facial expressions just slightly and your hands from however far away, you can talk like another person would, you know?

We met this guy who was deaf at the end of my mission right before I went home and so I was all gung ho about finishing off strong. I was in Micronesia. It was funny because with his family, we talked to the mom first and then the oldest daughter and then the youngest daughter and then we started on him. And I was so frustrated that I couldn't talk to him. It was kind of funny because we always thought, "oh, we don't know sign language" and he didn't really know sign language. He knew basic stuff. He even knew some gospel terminology to a point. He actually wasn't 100% deaf. He was 10% or something. A lot of deaf people can actually hear somewhat. And he was actually really good at lip reading and his mom kind of knew how to enunciate certain things in the language, in kind of a different way. It didn't sound like regular Pompeian, but it came across to him very well. Sometimes she would have to repeat herself and she would yell a lot because he would catch it and he would hear a little bit. So, sometimes she would sign if she knew the sign for it. So he kind of used a combination of words and signs to gain an understanding. The first concept we taught him in the lessons was God is our loving Heavenly Father. That was one lesson for him! We were just trying to explain the first sentence and the second sentence. "God is our loving Heavenly Father. He knows you Kenny!" and it frustrated the heck out of me because I was used to thinking, "okay! We're going to do the first

lesson here and the second lesson" and of course you're supposed to try and apply it to the person and stuff. I understand that to a degree, but I'd never seen anybody where they wanted to learn it, but had to go through the lessons so slowly. So, I came back here and I thought, "I want to learn ASL" so that one day I'll be able to go back and say, "Hi. My name is Jason" and just do all that stuff. So, I might go back. It's hard to say. I'd like to. I'm not going to do it while I'm single. I've heard that when you get married things get rough. So, my ideal situation is to go back with the wife, but it sounds like the ideal situation is very rare indeed and expensive, especially when you're young and mobile as a couple. So, I'll just go on the honeymoon or something.

So, I really liked ASL, I felt like there was a good reason for me to be in it. I learned it. I don't regret taking that class at all. It was kind of different from my Chem 105 experience, but I would still say that I failed to learn the grammar there. Even though there probably wasn't as much emphasis on it for that meatier class. So, it was still there. I still like ASL, but I'm not feeling pushed towards it. I don't know. Honestly, I haven't really run into very many deaf people either and I feel that with Kenny back in Pompeii, I could see that I at least wanted to be able to learn it so I could talk to him. I don't know, I think that's part of it, that now I can actually say, "Hi. How are you? Good," you know? Even though I won't be able to talk to him about these complex ideas, we'll still be able to communicate at least. At least now I understand that I have to do facial expressions with a sign and I can still talk to him by mouthing it, shouting it, I don't know. And I think he's a lot smarter than I gave him credit for at the time. He sees what I'm doing and you can make up stuff when you sign, you can improvise a little bit. So, I don't think the grammar is really going to matter there. That's not what I was thinking when I

decided I wasn't going to do ASL anymore. I was just thinking, "Well, ASL is still cool, but I'm not as excited about it as I was."

I actually retained a lot of vocabulary. I've talked to a lot of girls in the class and they kind of did the same thing as me. We were all excited to get into it and then we all got kind of tired of it and we just kind of left off. We don't really hate it or dislike it, but we were thinking, "I'm not sure I want to go through three more classes of this." And the grammar of sign language didn't really click with me, even though the teacher explained it. I still treat the grammar like it's English grammar, which is not right. So, I never really knew if I was doing it wrong or not. From what I understand, a deaf person will usually be able to tell or you'll tell them that you're just learning, you're very beginner status. I mean, they're not stupid. They'll see the context of what you're trying to say with your signs and try to put it together. Sometimes it doesn't work, but sometimes it does. So, the teacher knew sign language and I think she knew what I was trying to say most of the time. She did correct me and stuff but I feel like it wasn't consistent. I don't know. But the ASL grammar thing, when we had to get up in front of the class and sign something — we had to do a children's book. It's pretty standard for the ASL 101 classes. And I'll tell you what — I sure felt the not-knowing-the-grammar on that. Even though the teacher passed me with an A-, I thought, "What am I doing?" I was just throwing out signs that I knew because I was scared and I was freaking out. And so, I think it just stands out because it was a more socially embarrassing situation for me.

Jason — ASL Learning Failure Themes

The ASL course that Jason took was ASL 101: Intro to American Sign Language. The course introduces students to basic ASL skills, both receptive and expressive, and an introduction to the Deaf community and culture (retrieved January 24, 2014 from

http://saas.byu.edu/catalog/2013-2014ucat/departments/LangStudies/ASLCourses.php). Jason was trying to learn ASL so that he could communicate with the deaf, particularly a boy named Kenny that he met in Micronesia. Even though he earned a good grade in the class, Jason failed to achieve his goal to learn the grammar of ASL, which left him feeling insecure about his ability to communicate in sign language. The following major themes stood out in this case: Learning Failure, Social Anxiety, Social Justification, Conceptual Difficulty, Instructor Conflict, Past Experience, and Minimizing Failure.

Learning Failure. Jason wanted to learn ASL grammar in this course, but he failed to do so. Even though he earned a high grade in the course, this still stood out to him as a learning failure. He explained that, "I really liked ASL, I felt like there was a good reason for me to be in it. I learned it. I don't regret taking that class at all. It was kind of different from my Chem 105 experience, but I would still say that I failed to learn the grammar there." In reflecting further on his failure to learn ASL grammar, Jason explained, "But the ASL grammar thing, when we had to get up in front of the class and sign something — we had to do a children's book. It's pretty standard for the ASL 101 classes. And I'll tell you what — I sure felt the not-knowing-the-grammar on that. Even though the teacher passed me with an A-, I thought, 'what am I doing?'" There was a disconnect between Jason's personal learning goals for the course and the actual course outcomes as evidenced by the grade he received despite his learning failures.

Social anxiety. Jason recalled feeling embarrassed by his lack of ASL skill when he was asked to sign in front of his peers. Reflecting on a technical demonstration in the class he shared how, "I was just throwing out signs that I knew because I was scared and I was freaking out. And so, I think it just stands out because it was a more socially embarrassing situation for me." Jason did not want his peers and his instructor to lose confidence in his ability to learn the course

concepts by failing to use appropriate signs. He wanted to be perceived as competent through a proficient technical demonstration of what he had learned. He failed to perform well and was embarrassed.

Social justification. Jason justified his learning failures in the course by citing the learning failures of his peers. He explained that, "I've talked to a lot of girls in the class and they kind of did the same thing as me. We were all excited to get into it and then we all got kind of tired of it and we just kind of left off." Due to the fact that others had taken the course and given up on it, Jason felt justified in his decision to not resolve his learning failures from the course. He believed that he had accomplished as much or more than his peers in the course and that any extra effort to resolve his learning failures would be unnecessary.

Conceptual difficulty. Jason struggled to understand the concepts of ASL grammar. He expected it to be like English grammar, but when it was not, he struggled to accommodate the new ideas in his way of thinking. He shared how, "We don't really hate it or dislike it, but we were thinking, 'I'm not sure I want to go through three more classes of this.' And the grammar of sign language didn't really click with me, even though the teacher explained it. I still treat the grammar like it's English grammar, which is not right. So, I never really knew if I was doing it wrong or not." Due to the perceived difficult in learning ASL grammar, Jason decided that it would not be worth the investment in future courses to resolve his learning failures.

Instructor conflict. Jason lost confidence in the instructor when the feedback he received about his performance was inconsistent. In reflecting on the importance of feedback in the course, Jason explained that, "They'll see the context of what you're trying to say with your signs and try to put it together. Sometimes it doesn't work, but sometimes it does. So, the teacher knew sign language and I think she knew what I was trying to say most of the time. She did

correct me and stuff but I feel like it wasn't consistent." This lack of consistent feedback added to Jason's confusion about ASL grammar and contributed to his learning failure.

Past experience. Jason drew on past experiences to describe his motives for taking the ASL course and as a basis for understanding the course concepts. Jason shared that when he was trying to talk to his friend Kenny, "I was so frustrated that I couldn't talk to him. It was kind of funny because we always thought, 'oh, we don't know sign language' and he didn't really know sign language. He knew basic stuff." Jason's past experiences helped form his expectations for the ASL class and the learning experiences he would have. He expected to learn ASL grammar and when he failed to learn it, he felt disappointed, especially in light of his past experiences that motivated him to take the course in the first place.

Minimizing failure. Jason explained that his learning failures in the ASL course would not likely affect his future. Additionally, he shared how his limited ASL skills would be sufficient for him to communicate basic ideas. He stated that, "I haven't really run into very many deaf people either and I feel that with Kenny back in Pompeii, I could see that I at least wanted to be able to learn it so I could talk to him. I don't know, I think that's part of it, that now I can actually say, "Hi. How are you? Good," you know? Even though I won't be able to talk to him about these complex ideas, we'll still be able to communicate at least. At least now I understand that I have to do facial expressions with a sign and I can still talk to him by mouthing it, shouting it, I don't know." Jason minimized the potential impact of his learning failures in the course for two reasons. First, he did not perceive that his lack of skill would hinder any important future opportunities. Second, he believed that his limited ASL skills would be sufficient for him to communicate whatever he wanted to communicate with his friend, Kenny,

and others in the future. This minimization of the learning failures made it possible for Jason to justify his decision not to resolve them.

Amy — Cross-case Analysis

Amy's learning failure experiences differed significantly between her chemistry course and her statistics course. In the cross-analysis of these two cases, differences in how Amy reflectively described her learning failures were documented. The themes and insights related to the two cases were also further examined and documented.

Differences in learning failure reflections. Three key differences stood out between Amy's learning failures in the chemistry and statistics courses. The first difference was the initial reaction to the learning failures. Amy ended up taking the same chemistry course three times without earning a passing grade. Eventually she changed her major so that she could avoid the need to take and pass the class again in the future. In the statistics course, she failed and dropped the course the first time, but then she passed the course the second time she took it. The decision Amy made to avoid her learning failures in the chemistry course, but to resolve her learning failures in the statistics course was significant.

The second difference between Amy's descriptions of her learning failures in the two courses was the level of detail. The chemistry course learning failures were described in significantly greater detail than the learning failures in the statistics course. This was significant because Amy experienced greater success in the statistics course than in the chemistry course. In other words, Amy provided more detail about her learning failures when they went unresolved than she did about those she had resolved. This difference in the level of detail was due to extra reflection on those learning failures that went unresolved.

The third difference was in how Amy felt about the learning failure at the time of the interviews. Amy felt a sense of shame and embarrassment about her unresolved learning failures in the chemistry course at the time of the interviews. She continued to struggle to understand why the course had been so difficult for her. In contrast, she felt a sense of accomplishment at having successfully resolved her learning failures in the statistics course. This difference in feeling was significant because of the lasting impact the learning failure experiences from both courses had on Amy. The emotional impact of resolving or not resolving the learning failure was an unexpected finding in this study.

Cross-case learning failure themes. The themes from Amy's learning failure experiences in chemistry and statistics were compared and contrasted to further document their similarities and unique complexities. Through this analysis, additional themes were identified and included. This section reports on the following cross-case themes: Learning Failure, Social Dynamics, Self-doubt and Confidence Issues, Instructional Strategy, Conceptual Frameworks and Hard Concepts, Learning and Study Strategies, Social Anxiety, Effort Attribution, Analyzing Problems, Time Management, Remediation, Social Dependence, and Vague Goals.

Learning failure. Amy's goal in both the chemistry and the statistics course was to earn a high grade and to understand the course concepts. However, after learning failures in both courses she chose only to resolve her learning failures in the statistics course. Her learning failures in the chemistry course led her to change her major so that she could avoid the work required to resolve them. This was a significant finding of the study because it demonstrated how learning failure experiences affect future educational choices and outcomes. Also, the learning goals for both courses relied on feedback from instructors and peers. Earning a high grade in the course depended on the instructor assessing Amy's competence, primarily by written exams.

Mastering the course concepts also depended on Amy receiving formative feedback about her understanding from her instructor and peers. This reliance on feedback from others to achieve her learning goals further supported some of the other social themes associated with Amy's learning failures in the chemistry and the statistics courses.

Social dynamics. Amy mentioned the strength of her relationships with her instructor, the TA's, and her peers in the statistics course as part of the reason she succeed the second time through. By contrast, Amy's social experiences in the chemistry course were limited. She did not have the support of peers or the small group interaction opportunities like she had in the statistics course. As a result, Amy was more willing to ask questions and get the feedback she needed to accomplish her learning goals in the statistics course, but not in the chemistry course. Additionally, the social network in the statistics course provided support and encouragement for Amy to work through her learning failures while such a network did not exist in the chemistry course.

Self-doubt and confidence issues. Amy mentioned significant feelings of self-doubt related to her learning failures in both the chemistry and the statistics courses. In the chemistry course, these feelings were primarily the result of poor testing experiences. By contrast, Amy's confidence issues in the statistics course were the result of her perceptions about the course concepts being inherently difficult to learn. This demonstrated how Amy's expectations and perceptions of course difficulty affected her degree of confidence. Additionally, in both the chemistry and statistics courses, Amy's self-confidence was affected by the outcomes of her testing experiences as well as the feedback she received from her instructor, the TA's, and her peers.

Instructional strategy. Amy specifically mentioned helpful instructional strategies from her chemistry course, but not from her statistics course. Furthermore, the positive instructional strategy in the chemistry course was an isolated experience with no other reports from Amy about other instructional strategies, good or bad. The positive experience with the instructional strategy in the chemistry course stands out as something that led Amy to accomplish her learning goal for the course, in part — to understand the course concepts. The instructional strategy related to something that was familiar to Amy, something that she had seen before — balloons. No other novel or helpful instructional strategies were reported for either the chemistry or the statistics course.

Conceptual frameworks and hard concepts. In both the chemistry and the statistics courses, Amy struggled with hard concepts. She tried to conceptualize a framework within which she could understand the concepts. In the chemistry course, this conceptual framework was based on previous experiences with physics and math. In the statistics course, Amy tried to construct a conceptual framework by using additional sources of information like Wikipedia. In both courses initially, Amy failed to develop a way to understand course concepts within a conceptual framework that made sense. However, in the statistics course, Amy decided to ignore her additional information sources and to focus instead on the course concepts and framework that were provided to her. By doing this, Amy was able to learn the course concepts and how they related to one another when she took the course the second time.

Learning and study strategies. Amy stated that she would consistently show up late for her chemistry course, which led to her missing out on key explanations and opportunities to ask questions. She did not state that she had these same problems with her statistics course. On the contrary, Amy explained how easy it was for her to ask questions and be present for key

explanations of concepts in the statistics course. Also, in her reflections on her statistics course, Amy focused on the effect her note taking strategies had on her learning failures. However, note taking did not come up at all in her description of her chemistry course learning failures. Resolving her poor note-taking strategies in her statistics course led her to overcome her learning failures in that course. These findings demonstrated how inconsistent Amy's learning strategies were from course to course.

Social anxiety. In the chemistry course, Amy had difficulties asking for help when she did not understand a concept. She felt inferior to the other students who seemed to understand the course concepts. By contrast, Amy never mentioned feeling inferior to her classmates in the statistics course or that she ever had difficulty asking for help. The comparisons that Amy made between herself and the other students in both courses influenced the levels of anxiety she felt about getting the help she needed and about her relative performance to other students. These comparisons did not necessarily reflect reality, but they did influence Amy's levels of anxiety.

Effort attribution. In her chemistry course, Amy struggled to learn the course concepts on her own. She consistently stated how she did not put in the time necessary to learn the concepts. By contrast, Amy realized the importance of the TA's in the statistics course in helping her to learn the course concepts. In the chemistry course, Amy attributed her learning failures to a lack of time or effort. In the statistics course, she cited the help she received from the TA's as the reason for her success. This difference in attributions for her learning failures between courses emphasizes that Amy's attributions for her learning failures were highly contextual and inconsistent. The highly contextual and inconsistent nature of learning failure attributions was a significant finding in this study.

Analyzing problems. In her statistics course, Amy said that she struggled to analyze problems, to know which formulas to apply, and when to apply them. This difficulty with problem analysis was not mentioned in relation to the chemistry course. Additionally, as Amy was able to improve her ability to analyze assignment problems in the statistics course, she was able to resolve her learning failures. Amy was able to improve her ability to analyze assignment problems in the statistics course, but not in the chemistry course. Amy's ability to analyze assignment problems and to apply course concepts to solve them was a major influence in the learning failures of both the chemistry and the statistics courses.

Time management. In the statistics course, Amy's initial learning failures were influenced by poor time management practices. In the second attempt of the course, Amy was able to make more time to go to labs, both required and optional. She also made more time to work on the homework assignments. These improved time management skills led Amy to resolve her learning failures in the statistics course. By contrast, Amy did not use her time wisely in any of her three attempts of the chemistry course. She failed to put in the time needed to complete the homework assignments and she showed up late to class. Amy managed her time differently in the statistics course than in the chemistry course. This inconsistency in time management practices between courses demonstrated how Amy's motivation and engagement with the courses varied. The same variability of time management practices not only existed between the chemistry and statistics courses, but also between attempts of the same course.

Remediation. Amy was able to resolve her learning failures in the statistics course the second time she took it because she was able to fill in the gaps in her understanding from the first time she took the course. By contrast, Amy was unable to resolve her learning failures in the chemistry course, even after three attempts. Amy was able to retain more of the concepts from

the statistics course than from the chemistry course. Additionally, the remediation or resolution of her learning failures in the statistics course led Amy to pursue training to be a TA for the course. By contrast, the unresolved learning failures in the chemistry course led Amy to change her major and avoid them in the future.

Social dependence. In both the chemistry and the statistics courses, Amy relied heavily on her relationships with the instructor, the TA's, and other students to learn course concepts, to accomplish assignments, and to morally support her during her experiences. When these social relationships were strong and supportive, Amy thrived. When they were absent, she struggled. The strong social ties, coupled with the small and intimate class size the second time through statistics enabled Amy to successfully resolve her learning failures in the course. The absence of strong social ties in the chemistry course inhibited Amy from resolving her learning failures in the course.

Vague goals. Amy's lack of clear goals for her life greatly contributed to her learning failures. When course concepts did not relate to her career goals or her previous experiences, she struggled to understand them. Additionally, she struggled to relate well to instructors and students in courses that she was not interested in, which made it difficult for her to learn the concepts. Her poor performance led to her lack of confidence in her career goals, her learning strategies, and in her own capacity to succeed as a student. However, once Amy clarified her larger life goals she began to experience success by overcoming her learning failures and revising her learning goals.

Jason — Cross-case Analysis

Jason's learning failure experiences differed significantly between the chemistry course and the ASL course. In the cross-analysis of these two cases, differences in how Jason

reflectively described his learning failures were documented. The themes and insights related to the two cases were also further examined and documented.

Differences in learning failure reflections. Three key differences stood out between Jason's learning failures in the chemistry and ASL courses. The first difference was in the amount of detail provided for the learning failure experiences in each course. Jason provided a significantly greater amount of detail about his learning failures in the chemistry course than in the ASL course. The details of the ASL course focused primarily on the embarrassment Jason felt at not learning ASL grammar and on the way his learning failures related to those of other students in the course. By contrast, Jason's reflection on the learning failures in his chemistry course provided significant detail about course assignments, instructional strategies, exam structures, etc.

The second difference was in the level of social detail included about the experience. In his reflections on his learning failures in the ASL course, Jason shared significant details about his social embarrassments, his socially oriented motives for taking the course, and the social justifications he made regarding his learning failures in the course. By contrast, the details he shared about his learning failures in the chemistry course were more conceptually oriented, with the social factors playing a minor role.

The third difference was in the role that the final course grades related to the learning failure experiences. Jason's final grade in the chemistry course was a D+ while his final grade in the ASL course was an A-. Jason was disappointed, but not surprised, by his low course grade for chemistry. By contrast, Jason was disappointed that his high course grade in ASL did not reflect his ability to communicate using ASL grammar rules. This demonstrated that final course grades were not a consistent indicator for identifying Jason's learning failures.

Cross-case learning failure themes. The themes from Jason's learning failure experiences in chemistry and ASL were compared and contrasted to further document their similarities and unique complexities. Through this analysis, additional themes were identified and included. This section reports on the following cross-case themes: Learning Failure, Conceptual Difficulty, Career Application, Effort Attribution, Social Anxiety, Homework, Poor analysis, Self-awareness, Learning Strategies, Social Justification, Instructor Conflict, Past Experience, Minimizing Failure, Failure Reactions, and Social Difficulties.

Learning failure. Jason's learning goals for the chemistry course included earning a passing grade in the course and understanding the course concepts. Jason took the chemistry course because at the time it was part of his Exercise Science major. His career goal was to become a PA/PT. The learning failures in the chemistry course led Jason to change his major to Communications and to abandon his career goal of becoming a PA/PT. By contrast, his goals for the ASL course were to learn ASL signs and grammar rules that would enable him to communicate with a friend he made while serving a mission in Micronesia. The ASL course was more for Jason's personal enrichment than for his professional preparation. Jason's learning failures in the ASL course had little to no impact on his future learning goals. By failing to learn ASL grammar, Jason rationalized that what he had learned in the course would be sufficient to communicate what he wanted, albeit in a limited way. His failure to learn ASL grammar in the course led Jason to re-define his initial learning goals so that he could justify his learning failures in the course.

Conceptual difficulty. Jason struggled with course concepts in both the chemistry and the ASL courses. However, the concepts in the chemistry course progressively built upon one another. As Jason failed to learn the course concepts in the beginning of the course, his difficulty

learning later course concepts was compounded. By contrast, the ASL concepts did not progressively build on one another. Jason's struggle in the ASL course was to understand how the course concepts related to other concepts he was familiar with in English. In the chemistry course, the concepts were foreign enough to his past experiences that he failed to develop a framework for understanding the new concepts and definitions. With the ASL course, Jason's difficulty was due to his failure to fit ASL grammar and rules within his existing conceptual framework for English. Additionally, in both the ASL and the chemistry courses, Jason developed his understanding of course concepts by trial and error. In the chemistry course he would guess at answers to homework assignments and exam questions. In ASL course he would guess at signs and their orders when asked to do presentations in front of his classmates. The limited or inconsistent nature of the feedback that Jason received in both the ASL and the chemistry courses impaired his ability to learn the course concepts by trial and error.

Career application. While Jason's learning failures in the chemistry course had a significant impact on his career goals, his learning failures in the ASL course did not. This was largely due to Jason's respective motives for taking each course. In the chemistry course, Jason's expectations of what his future career activities would be significantly influenced his levels of engagement, his ability to understand course concepts, and his future learning goals. By contrast, Jason did not mention any career related interests related to ASL. The ASL course was taken exclusively for personal enrichment, not for professional development. This major difference in Jason's motives for taking each course demonstrated that career preparation was not a primary motive for his learning goals. Additionally, this difference in Jason's motives demonstrated how his motives significantly influenced how he failed in each course.

Effort attribution. In the chemistry course, Jason attributed his learning failures to his lack of effort to learn the course concepts and to put in the time necessary to prepare for exams. By contrast, Jason did not mention a lack of effort in the ASL course. His explanation of his learning failures in the ASL course was that they were due to poor or inconsistent feedback from the instructor. While he made the effort to learn ASL course concepts and grammar rules, he did not indicate that his effort in the class was anything but his best. This difference between the attributions for his learning failures in the ASL and the chemistry courses demonstrated that Jason perceived his failures to be due to inherently different reasons. Therefore, he believed that the learning failures in each course were different enough that they would require different strategies to resolve. In the chemistry course, Jason needed to put in more time and effort to overcome his learning failures. In his ASL course, he would need a greater amount of feedback from the instructor with more targeted suggestions for improving his communication skills.

Social anxiety. Jason's struggles with social anxiety contributed to his learning failures in both the chemistry and the ASL courses. In the chemistry course, Jason was afraid to ask any question that was too basic or irrelevant. Jason's social anxiety in the ASL course prevented him from doing anything that could be considered a mistake in front of his instructor and classmates. In both courses, Jason's social anxiety limited his participation in the course and reduced his opportunities to clarify questions about course concepts, receive formative feedback about his understanding, and learn the material covered on exams. This common theme of social anxiety in both the chemistry and the ASL courses demonstrated Jason's motive to avoid social embarrassment, even at the expense of his learning.

Homework. Jason specifically mentioned the influence that homework assignments had on his learning failures in the chemistry course. By contrast, he did not mention anything about

homework or assignments in the ASL course. In the chemistry course, Jason experienced frustration with the homework assignments because it did not allow him to learn when getting answers wrong. His expectation was that when his answers to homework problems were wrong, there should be some way for him to identify why they were wrong. He did mention this lack of formative feedback in the ASL course in relation to the lack of detailed and consistent feedback received from the instructor.

Poor analysis. In both the chemistry and the ASL courses, Jason struggled to analyze his learning failures. While there was significantly more detail about the poor analysis of his learning failures in the chemistry course, Jason's lack of reasoning for his learning failures in the ASL course demonstrated that he struggled in both courses. He struggled to identify what it was about course concepts that did not make sense to him. Jason's attempts to metacognitively evaluate his learning failures were vague and inconclusive. Due to the fact that Jason was not able to analyze or evaluate his learning failures, he struggled to know what he needed help with in the courses. This made it even more difficult for Jason to ask for help from instructors and peers.

Self-awareness. Jason's learning failures provide opportunities for self-discovery and greater self-awareness. Due to his learning failures in the chemistry course, Jason learned that he did not enjoy chemistry or math. Alternatively, his learning failures in the ASL course helped him to realize that he was able to communicate most of what he wanted to communicate with the skills he had developed in the course, despite the learning failures. This self-discovery process demonstrated the pivotal nature of Jason's learning failure experiences and their impact on his future learning and career goals.

Learning strategies. Jason specifically mentioned his poor learning strategies and their contribution to his learning failures in the chemistry course. Although he did not mention anything about his learning strategies in the ASL course, his failure to learn the ASL grammar demonstrated that he lacked the necessary learning strategies for that course as well. In the chemistry course, Jason's learning strategies consisted of guessing on the homework and the exams, trying to learn from his classmates' mistakes, and hoping that would be able to memorize concepts and definitions sufficient to pass course exams. Jason was not able to develop a good pattern of study or to identify key learning strategies for either course.

Social justification. In both the chemistry and the ASL courses, Jason justified his learning failures and his decision not to resolve them by referring to others in the courses that had the same experience. In the chemistry course, Jason referred to the experience of another classmate who felt lost throughout the entire course, ended up changing her major, and choosing to avoid chemistry courses in the future. In the ASL course, Jason referred to the experience of several classmates who struggled to learn the grammar rules for ASL and decided not to take further ASL courses. Jason's justifications for his learning failures in both the chemistry and ASL courses demonstrated that he was only able to feel comfortable with his learning failures and the decision to not resolve them if there were others around him that had the same experience.

Instructor conflict. In the chemistry course, Jason explained how many opportunities and invitations his instructor had made to the students in the course to learn the material and to get the help they needed. By contrast, Jason felt that his instructor in the ASL course did not provide the necessary opportunities or invitations to get the help he needed. He explained how the inconsistent feedback from his instructor in the ASL course contributed to his learning

failures in that course. This contrast between Jason's interactions with his instructors demonstrated that while these interactions influenced his learning failures they were not the sole cause.

Past experience. Jason's past experiences played different roles in his learning failures in the chemistry and the ASL courses. In the chemistry courses, Jason drew heavily on his previous experiences with math and science to try to understand the course concepts. Additionally, his previous math anxiety played a role in the way he engaged in the course. Jason struggled with the course concepts and had a hard time making sense of them in light of what he had experienced in the past. With the ASL course, Jason's previous experiences with his friend, Kenny, from Micronesia served as motives and as a foundation for expectations about the course. He expected to learn ASL grammar in the ASL course and when he failed to learn it, he felt disappointed. This difference in the way Jason's past experiences influenced his learning failures in the chemistry and the ASL courses demonstrated the influence his past experiences had on how he failed in the courses.

Minimizing failure. Jason minimized the impact his learning failures in the ASL course would have on his future. He did the same thing in regards to his learning failures in the chemistry course, but in a much more limited way. After his learning failure experiences in the ASL course, Jason decided that his original goal of learning ASL grammar was not as important as it had been because he would be able to communicate what he wanted to communicate with his limited skills. The fact that the course was being taken for reasons of personal enrichment and not for professional preparation made this fairly easy for Jason. However, his learning failures in the chemistry course were preventing him from progressing in his major, which meant that he would have to either pass the course or change his major. After making the choice to

change his major, Jason decided that the learning failures in chemistry were not worth resolving because the course was not part of his new major. Jason's attempt to minimize the effects of his learning failures on his future opportunities demonstrated his need to justify his learning failures to himself and others.

Failure reactions. Jason had different learning goals for each course and as a result, his reaction to his learning failures in each course was different. He was really frustrated with his learning failures in the chemistry course, but satisfied with the mediocrity of his skills acquired in the ASL course. Jason's learning goals had different implications for his future personal and professional activities, which influenced his different reactions to his learning failures. But additionally, Jason's difficulty evaluating his learning failures in the chemistry course beyond his lack of effort frustrated him. He believed he had not applied himself as much as he could have and so he felt regret about his learning failures in the course. By contrast, Jason believed he had made the effort necessary to learn the course concepts in the ASL course and that his learning failures were due more to poor feedback from the instructor. Due to the fact that his learning failures seemed less in his control in the ASL course, Jason did not feel as much regret about them.

Social difficulties. Most of Jason's difficulty in his classes related to social anxiety about getting the help he needed. In the chemistry course, he failed to get the help he needed because he was embarrassed to ask his questions in front of his peers. He did not feel strong personal connections to other students or the instructor, which would have helped him with his learning failures. Additionally, he chose to focus on the failures of others to justify his own instead of focusing on their successes to find ways to succeed. In the ASL course, Jason was able to form social ties with the other students, but struggled to communicate effectively with the instructor to

get the feedback he needed to succeed. Jason needed stronger social relationships with instructors and students that would support him in working through his learning failures in the course.

Amy-Jason Cross-case Analysis

The learning failure experiences of Amy and Jason were significantly different from one another. Both of them took the same chemistry course, but the statistics and ASL courses were exclusive to Amy and Jason respectively. In the cross-analysis of these four cases, key differences in the way Amy and Jason reflectively described their experiences were documented. The themes and insights related to the four cases were also further examined and documented.

Differences in learning failure reflections. Three key differences stood out between the learning failure reflections of Amy and Jason. The first difference was in the way Amy and Jason felt about their respective learning failures in the courses at the time of the interviews. Amy felt shame and embarrassment about her learning failures experiences in the chemistry course. By contrast, Jason felt frustration about his learning failure experiences in the chemistry course, not shame or embarrassment. Both Amy and Jason switched majors to avoid having to take and pass the chemistry course. However, this led Amy to feel the shame and embarrassment at not being able to pass the course while Jason felt relieved at not having to take and pass the course for his new major. Additionally, Amy felt a sense of success and accomplishment because she was able to resolve her learning failures in her statistics course. By contrast, Jason was not able to resolve his learning failures in either the chemistry or the ASL courses, so he did not experience these same positive feelings. Jason sought to minimize the impact of his learning failures on his future opportunities while Amy felt a sense of regret at not being able to work through her learning failures in chemistry. These differences demonstrate how Amy and Jason had significantly

different feelings about the learning failures in each of their courses, even in the same chemistry course that they both took.

The second difference was in the amount of information they remembered about each of their learning failure experiences. Both Amy and Jason remembered significantly more detail about their learning failures in the chemistry course than they did about their learning failures in the other courses. Their chemistry course learning failures included information about course concepts, assignments, social dynamics, etc. By contrast, Amy's reflection on her learning failures in the statistics course focused mainly on the social dynamics of the course and how she worked through the initial learning failure. Jason's reflection on his learning failures in the ASL course focused on his motives for taking the course and on the social implications of his learning failures. These differences in level of detail demonstrated that the nature and severity of Jason and Amy's learning failure experiences influenced the degree of their reflection on those experiences.

The third difference was in the emphasis each of them put on the role of the instructor, the TA's, and their peers. In both the chemistry and the statistics courses, Amy's reflections focused on the importance of her relationships with classmates, TA's, and the instructor relative to her learning failures. In the chemistry course, these relationships were weak, contributing to her unresolvable learning failures. In the statistics course, these relationships were strong, contributing to her ability to resolve her learning failures. By contrast, Jason's reflections on his learning failures in the chemistry and the ASL courses revealed a different social dynamic. In the chemistry course, Jason's relationships with his peers, the TA's, and the instructor prevented him from asking questions to get the help he needed to understand the course concepts. In the ASL course, his relationships with peers allowed him to justify his learning failures, while his

relationship with the instructor complicated his learning experience. These differences in the influence of peers, TA's, and instructors demonstrated how social dynamics influenced Amy and Jason's learning failures differently in each of their respective courses.

Cross-case learning failure themes. The themes from Amy and Jason's learning failure experiences were compared and contrasted to further document their similarities and unique complexities. Through this analysis, additional themes were identified and included. This section reports on the following cross-case themes: Learning Failure, Conceptual Frameworks and Hard Concepts, Career Application, Effort Attribution, Social Anxiety, Instructional Strategies, Analysis Problems, Instructor Conflict, Self-doubt, Self-discovery, Learning and Study Strategies, Social Justification, Past Experience, Minimizing Failure, Time Management, Remediation, Social Dynamics, Future Goals, and Unique Failures.

Learning failure. In the chemistry course, Amy and Jason both wanted to earn a high grade in the course and understand the course concepts. Amy also had these same goals in the statistics course. Alternatively, Jason's goal in the ASL course was to learn to communicate with his deaf friend from Micronesia. The learning failures of Amy and Jason in the chemistry and the statistics courses resulted in low course grades and poor comprehension. By contrast, Jason's learning failures in the ASL course did not prevent him from earning a high course grade. These differences in learning goals and course grades demonstrated how final course grades were not necessarily a good indicator of whether or not Amy and Jason accomplished their learning goals.

Both Amy and Jason decided to change their major because of their learning failures in the chemistry course. By contrast, Amy's learning failures in the statistics course and Jason's learning failures in the ASL course led them both to different future outcomes. Amy was able to resolve her learning failures in the statistics course, which led her to pursue training as a TA for

the course. Jason did learn ASL grammar in the course as he had intended to, but then decided he did not need to resolve his learning failures in the course because what he had learned would be sufficient for his future purposes. This difference in what Amy and Jason chose to do about their learning failures demonstrated how unique the learning failures were in each of their courses.

Conceptual frameworks and hard concepts. Amy and Jason both struggled in their courses with hard concepts and generally lacked conceptual frameworks that would help them understand how the concepts related to one another. In the chemistry course, both Amy and Jason attempted to use their past experiences with math and science courses to develop a conceptual framework. Both Amy and Jason were unsuccessful in these attempts, which led to difficulties understanding the course concepts. In the statistics course, Amy tried unsuccessfully to use additional sources of information like Wikipedia to develop a conceptual framework. In the ASL course, Jason tried unsuccessfully to fit the ASL concepts he was learning into his conceptual framework of the English language. Additionally, Jason guessed at signs and grammar usage in the ASL course, which did not help him learn the course concepts. The futile attempts made by Amy and Jason to develop conceptual frameworks for their course concepts demonstrated how a lack of conceptual frameworks contributed to their learning failures.

Career application. Jason's learning failures in the chemistry course were significantly influenced by his concept of his future career activities. By contrast, Amy's learning failure experiences in the chemistry and the statistics courses were not explicitly related to her concept of her future career activities. Amy took the chemistry and the statistics courses because they were part of her major at the time, but she did not mention any relationship between these courses and her future professional activities. This difference in influence of future career activities on learning failure experiences demonstrated the different motives Amy and Jason had

for taking their respective courses. Additionally it demonstrated the degree to which the individual course designs focused on preparing Amy and Jason for their future career activities.

Effort attribution. Both Amy and Jason believed that a lack of effort led to their learning failures in the chemistry course. By contrast, neither Amy nor Jason attributed their success or failures in the statistics or the ASL courses to personal effort. Amy attributed her success in resolving her learning failures in the statistics course to the help she received from classmates and TA's. Likewise, Jason attributed his learning failures in the ASL course to a lack of helpful feedback from the instructor. This difference in attributions for their learning failures demonstrated how Amy and Jason's attributions were course-specific. Additionally, it demonstrated how the different levels of support Amy and Jason received from their peers, TA's, and instructors influenced their attributions for their learning failures.

Social anxiety. Both Amy and Jason experienced social anxiety in their courses, which contributed to their learning failures. However, the reasons for Amy and Jason's social anxiety were different. In the Chemistry course, Amy felt socially anxious because she would show up late to class and did not want to make the instructor go back and explain concepts she would have learned had she been on time. She also felt inferior to other students because she perceived that she was the only one that did not understand the course concepts. Jason's social anxiety came from the desire to avoid social embarrassment by asking basic or irrelevant questions. In both cases, Amy and Jason failed to understand the course concepts in the chemistry course and the social anxiety they felt kept them from getting the help they needed to understand the concepts. In the ASL course, Jason felt embarrassed when he made mistakes in front of the course. He wanted to be perceived as competent in ASL by his classmates and the instructor. Amy did not feel any social anxiety the second time she took the statistics course because the

class size was small and she had a better experience with the TA's. These experiences with social anxiety demonstrated how Amy and Jason struggled to get the help they needed to understand course concepts when they did not feel comfortable making mistakes in front of their peers, TA's, and instructors.

Instructional strategy. Amy was the only one that mentioned a specific instructional strategy in her learning failure reflections. The positive instructional strategy in the chemistry course was an isolated experience with no other reports from her about other instructional strategies, good or bad. The instructional strategy related to something that was familiar to Amy — balloons. Jason mentioned his frustration in trying to make sense of the delivered instruction in the chemistry course, but he did not mention any specific strategy that the instructor used. Neither Amy nor Jason mentioned specific instructional strategies that were used by the instructor in the statistics or the ASL courses. The lack of detail about instructional strategies in the learning failure reflections from Amy and Jason demonstrated that Amy and Jason were not benefited by those instructional strategies that were employed in their courses. The ineffective instructional strategies contributed to Amy and Jason's learning failures.

Analysis problems. Both Amy and Jason had difficulty analyzing their learning failures in the courses. In statistics, Amy struggled to analyze problems and correctly apply statistical formulas. Jason struggled to analyze problems in the chemistry course and to identify why he would get wrong answers to the problems. He also struggled to analyze proper grammar usage in the ASL course. In addition to the analysis of assignment problems, both Amy and Jason struggled to metacognitively evaluate their learning failures. They both struggled to identify what it was that they did not understand about the course concepts. This lack of evaluation, together with their difficulty analyzing problems demonstrated how Amy and Jason's failure to

analyze their experiences significantly contributed to their learning failures in the courses. Furthermore, Amy's ability to resolve her learning failures in the statistics course was due to the assistance from course TA's who helped her to analyze and address her previous learning failures. Without the help from the course TA's, Amy could not have resolved her learning failures. This further demonstrated the importance of evaluation capacity in Amy and Jason being able to resolve their learning failures.

Instructor conflict. Jason is the only one that mentioned an instructor conflict as part of his reflections on his learning failures. In the ASL course, Jason struggled to get the feedback he needed from the instructor to overcome his learning failures in the course. By contrast, Jason explained how many opportunities the instructor in the chemistry course provided to students to get extra help and feedback on course concepts and exam problems. Amy did not mention anything about her chemistry instructor except that he was known to be a difficult professor. In the statistics course, Amy also failed to mention details about the instructor. This difference in detail about instructor interaction demonstrated that interactions with the instructor were not always a contributing influence in Amy and Jason's learning failures.

Self-doubt and confidence issues. Only Amy mentioned significant feelings of self-doubt related to her learning failures. By contrast, Jason did not specifically mention having feelings of self-doubt or a lack of confidence in his reflections on his learning failures. Amy began the chemistry course with feelings of being underprepared and under qualified. These feelings grew worse as she performed poorly on the course exams. Jason performed poorly on the exams in the chemistry course as well, but he attributed the failures to poor preparation and lack of effort rather than lack of ability. Amy likewise attributed her learning failures in the chemistry course to a lack of ability, but she also struggled with feelings that she lacked the

ability to succeed in the course. In the statistics course, Amy initially believed that the concepts were too difficult for her to learn. This led her to a lack of confidence in her ability to succeed in the course. This difference in feelings of self-doubt and lack of confidence between Amy and Jason demonstrated that the feelings might not always be a result of learning failure experiences. These feelings may be the result of past experiences and course expectations.

Self-discovery. The learning failure experiences of both Amy and Jason led them to understand more about themselves, their preferences, and their abilities. Both Amy and Jason changed their majors as a result of their learning failures in the chemistry course. They both realized that they were not willing to put in the time and work to resolve those learning failures and decided to leave them unresolved. By contrast, in the statistics course, Amy realized that she was able to resolve her learning failures. She discovered that her previous doubts about her ability to succeed in the course were wrong and that she was capable of understanding statistical concepts. Jason had a different discovery in the ASL course related to the skills he developed in the course. He discovered that he was more capable of communication with the limited skills he developed in the course than he had previously believed. This led Jason to revise his learning goal of learning ASL grammar and to justify not resolving his learning failure. These self-discoveries made by Amy and Jason demonstrated the potential that their learning failure experiences had to help them learn more about themselves.

Learning and study strategies. Both and Amy and Jason mentioned poor learning strategies in their reflections on their learning failures. Amy was consistently late to the chemistry course, which meant that she missed out on key explanation of course concepts. Then she would feel embarrassed about asking questions and making the instructor explain things again. Jason explained how he limited his participation in the chemistry class because he did not

want to do something wrong that would embarrass him in front of his classmates. He also spent a lot of time guessing on the homework problems and the exams in the course. This guessing strategy and his unwillingness to ask questions in class impaired Jason's ability to understand the course concepts. By contrast, Amy was successful in the statistics course because she was able to improve upon the note-taking strategies she had begun the first time she took the course. She paid more attention, drew diagrams, and was able to use the notes when she began her training as a TA for the course. These different reflections about learning strategies demonstrated that neither Amy nor Jason were consistent in their approaches to learning in their courses. Additionally it demonstrated that when study strategies were improved it enabled Amy to resolve her learning failures.

Social justification. Jason referred to the learning failures of others in the chemistry and the ASL courses to justify his learning failures and his decision not to resolve them. By contrast, Amy never tried to justify her learning failure experiences based on the learning failures of others. In both the chemistry and ASL courses, Jason identified others who were struggling with course concepts or who chose not to resolve their learning failures as a way to justify his own learning failures. He noted the similarities and the differences between his experiences and the experiences of his classmates and then used the comparison to rationalize that he did not need to resolve his learning failures. Rather than focus on the learning failures of others, Amy focused exclusively on her own learning failures in an attempt to understand and evaluate them. In the statistics course, she was able with the help of the TA's to successfully evaluate and resolve her learning failures. In the chemistry course, she was not able to evaluate her learning failures sufficiently to resolve them. This difference in social justification practices between Amy and

Jason demonstrated that justification of learning failures based on the experience of others impeded the resolution of the learning failures.

Past experience. Amy and Jason both had past experiences that contributed to their learning failures. Amy struggled in the chemistry course because she believed her failure to take a high school chemistry course significantly impaired her preparation for the college chemistry course. This affected her confidence in her ability to succeed in the course, which was reinforced by poor performance on the tests. Similarly, Jason had experienced difficulty in the chemistry course because he would try to relate course concepts to experiences and understanding of math and science concepts from his past. He was unsuccessful in his attempts and struggled to make sense of the course concepts in any meaningful way. In the statistics course, Amy was able to retain some of the concepts from the first time she took the course and fill in the gaps the second time she took the course. Her past experiences in the course the first time prepared her to succeed when she took the course the second time. By contrast, Jason's decision to take the ASL course was motivated by past experiences he had with a deaf friend he made while serving a mission in Micronesia. These past experiences provided Jason with motivation and expectations for the ASL course, which influenced his learning failures in the course. These different influences of past experience on the learning failures of Jason and Amy demonstrated how differently and contextually past experiences influenced their learning failures.

Minimizing failure. Jason minimized the meaning and importance of his learning failures in both the chemistry and the ASL courses. Amy did not attempt to minimize her learning failures. Jason decided that resolving his learning failures in the chemistry course would be unnecessary because it would no longer be required in his new major. He minimized the need to resolve the learning failures in the chemistry course because they no longer impeded his

professional development and career preparation. In the ASL course, Jason failed to learn ASL grammar, but minimized the learning failure by rationalizing that what he had learned would be sufficient for him to communicate in basic, limited ways. He minimized the need to resolve these learning failures because they did not clearly impede any of his personal future goals. He decided instead to revise his initial learning goal to fit the results of his learning failures in the course. By contrast, Amy did not try to minimize or rationalize her learning failures in the statistics or the chemistry course. In the statistics course, Amy was assisted by the TA's to resolve her learning failures. However, in the chemistry course, Amy was unable to find a way to resolve her learning failures. As a result, at the time of the interviews for this study, Amy continued to feel a sense of shame and embarrassment at not being able to resolve her learning failures in the course. This difference in strategies to minimize the meaning and importance of their learning failures demonstrated the different way that Amy and Jason chose to deal with the disappointment of their learning failures. Additionally, it demonstrated how minimizing the meaning and importance of learning failures may prevent them from being resolved.

Time management. Both Amy and Jason struggled with time management in their courses. In Amy's second attempt of the statistics course, she was able to make more time to go to labs, both required and optional. She also made more time to work on the homework assignments. By contrast, she was late to the chemistry course and often procrastinated doing the assignments for the course. Jason also struggled with the assignments in the chemistry course and would procrastinate completing them. He also struggled to make time to study and learn the course concepts because he was busy with other courses at the same time. He further explained that he took the final exam for the chemistry course without studying because he had run out of time. This difference in time Amy and Jason's time management practices demonstrated the

difficulty they both had in balancing the learning demands for their multiple courses. It also demonstrated how their lack of consistent time management skills significantly contributed to their learning failures.

Remediation. Only Amy shared an experience resolving the learning failures from her courses. In the second time she took the statistics course, Amy was able to get into a smaller class, with supportive TA's, using better note-taking strategies to resolve her learning failures from her first time. Being able to resolve her learning failures in the course led Amy to pursue training to be a TA for the course. She also began to enjoy learning about statistics. By contrast, both Amy and Jason felt an aversion toward their unresolved learning failures in the chemistry course. They both changed majors to avoid the need to resolve their learning failures. Jason also decided not to resolve his learning failures in the ASL course. These effects of remediation on Amy demonstrated the potential that resolving learning failures has to change attitudes about course concepts and about personal capacity to accomplish future learning goals.

Social dynamics. Amy relied heavily on her relationships with other students to learn course concepts, to accomplish assignments, and to morally support her during her experiences. By contrast, Jason's social ties to classmates and his instructors did not support him in accomplishing his learning goals. Amy's strong social ties to TA's and classmates in the statistics course were a critical part of her getting the help she needed to resolve her learning failures from the first time she took the course. Additionally, Amy explained that these social ties to classmates, TA's, and the instructor were lacking in the chemistry course and that she did not feel supported. While Jason experienced the same social disconnect in the chemistry course that Amy experienced, he did not mention that it influenced his learning failures in the course. By contrast, Jason's social relationships in both the chemistry and the ASL courses led him to avoid

embarrassment and to limit his participation. These differences in the role of social relationships demonstrated that the nature of the relationships influenced Amy and Jason's learning failures as well as the remediation of those learning failures.

Future goals. Both Amy and Jason struggled to establish clear goals for their education and future careers. In the chemistry course, when course concepts did not relate to her career goals or her previous experiences, Amy struggled to understand them. Jason also struggled to see the application of course concepts in the chemistry course. Their learning failures in the chemistry course led both Amy and Jason to redefine their future education and career goals by changing their major. In the statistics course, Amy resolved her learning failures and trained to be a TA for the course. After changing her major, she lamented that she was not able to become a TA for the course because that had been one of the clearer goals she had for herself. Jason's learning failures in the ASL course led him to redefine his learning goals as well as his future personal goals. These clarifications to his future goals allowed him to clearly decide whether or not he would resolve his learning failures in the chemistry and the ASL courses. These experiences with future goals demonstrated that Amy and Jason's learning failures were influenced by their future goals. Additionally, it demonstrated the influence their learning failure experiences had on the clarification and revision of their future goals.

Unique failures. Each learning failure experience that Amy and Jason shared had unique elements that made the generalization of trends across the experiences difficult. This was true in comparisons between both students, but also in comparisons across their individual experiences. Neither student failed the same way or for the same reasons in multiple courses. While there were a few common elements across the learning failures such as social dynamics, course structure, and relevance to future activities, there was an even greater range of interesting

differences. For example, Amy worked hard to overcome her learning failures in the statistics course to the point that she was able to teach the concepts to others. However, in the chemistry course, she failed to understand the concepts sufficient to earn a passing grade. Jason wanted to learn ASL to communicate with a friend from Micronesia, but only succeeded in learning a limited number of words without the grammar rules, even though he earned a high grade in the course. He failed to understand the course concepts in the chemistry course and also failed to earn a passing grade in the course. These inconsistencies across the experiences demonstrated the unique and contextual nature of both Amy and Jason's learning failure experiences.

Summary

This purpose of this study was to generate a deeper understanding of college student learning failures from the perspective of the student. This study revealed significant insights about how college students reflectively describe their learning failures. Four cases were generated from interviews with two college students, which cases were then analyzed for important themes. This study analyzed and explored 78 themes across the four cases. Table 1 contains a list of these themes and their respective cases/analyses. The results of this study built upon existing themes from the literature, namely fear of failure and causal attributions for failure. From the analyses conducted, it is clear that learning failure experiences are rich and complex. Their themes are often difficult to generalize because of their personal and contextual nature. Key assertions about college student learning failures that have emerged from the results of this study will be discussed in detail in the next section. Additionally, the implications for research and practice resulting from this study will also be discussed.

Table 1

Cases and Themes

Amy – Chemistry	Amy – Statistics	Amy – Cross Case	Amy-Jason Cross-Case
Learning Failure Self-Doubt Learning Strategies Instructional Strategy Social Anxiety Effort Attribution Conceptual Framework	Learning Failure Hard Concepts Analyzing Problems Study Strategies Time Management Confidence Issues Social Dynamics Remediation	Learning Failure Social Dynamics Self-Doubt and Confidence Issues Instructional Strategy Conceptual Frameworks and Hard Concepts Learning and Study Strategies Social Anxiety Effort Attribution Analyzing Problems Time Management Remediation Social Dependence Vague Goals	Learning Failure Conceptual Frameworks and Hard Concepts Career Application Effort Attribution Social Anxiety Instructional Strategy Analysis Problems Instructor conflict Self-Doubt and Confidence Issues Self-Discovery Learning and Study Strategies Social Justification Past Experience Minimizing Failure Time Management Remediation Social Dynamics Future Goals Unique Failures
Jason - Chemistry	**Jason – ASL**	**Jason Cross-Case**	
Learning Failure Career Application Conceptual Difficulty Poor Analysis Self-Awareness Effort Attribution Learning Strategies Social Anxiety Homework	Learning Failure Social Anxiety Social Justification Conceptual Difficulty Instructor conflict Past Experience Minimizing Failure	Learning Failure Conceptual Difficulty Career Application Effort Attribution Social Anxiety Homework Poor Analysis Self-Awareness Learning Strategies Social Justification Instructor conflict Past Experience Minimizing Failure Failure Reactions Social Difficulties	

Discussion

The purpose of this study was to explore the following two research questions:

1. How does a college student reflectively describe and explain his/her learning failures?
2. What are the important themes of learning failure experiences from a college student's perspective?

The findings developed and reported in the previous section have significantly expanded on existing findings from the academic literature. The findings in this report about college students' reflections on their learning failures were not present before this study was conducted. In addition, 78 themes related to learning failures experiences were reported, expanding on the original two that were present in the academic literature prior to this study. This section of the report first includes a discussion of the findings and assertions that emerged from this study. Second, it contains implications for future research and practice. Lastly, it contains an analysis of the study and its limitations.

Discussion of Findings and Assertions

This section of the report discusses the findings and assertions about learning failure experiences as they relate to the existing academic literature. The discussion will focus on the following six categories of assertions: Recognizing Learning Failures, Evaluating Learning Failures, Attributions for Learning Failures, Self-Discovery Through Learning Failure, Past Experience and Future Expectations, and Social Influence.

Recognizing learning failures. The first key feature of college student learning failures that emerged in this study was the way that Amy and Jason recognized their learning failures. Diener and Dweck (1978) point out that learning failures may be difficult for researchers to identify, but the results of this study have shown that this is also true for the students themselves.

The way that Amy and Jason recognized their learning failures varied from course to course. Sometimes it came when they received their final grade in the course. At other times, it came after getting a test back. Still, at other times it was when they asked an awkward question or failed to perform up to par in front of their classmates. With the chemistry course, Amy expected to pass the course without having to retake it. Failing the course three times led her to recognize her learning failures in the course. Formative feedback from instructors, TA's, and peers was also one of the key ways Amy and Jason identified their learning failures. In the chemistry course, Jason also identified his learning failures due to the fact that he lacked logical reasoning for the answers he came up with for homework problems and exam questions. In the ASL course, Jason earned a high grade in the course that failed to represent his lack of understanding about ASL grammar, which was a critical part of his personal learning goal for the course. Due to these numerous and highly contextual ways Amy and Jason identified their learning failures, it became apparent that these learning failure experiences are far more complex than they were portrayed in the academic literature. This complexity makes the experiences difficult to identify, evaluate, and resolve.

Another feature of Amy and Jason's learning failures was that neither of them failed to accomplish all of their learning goals in a course. There were always concepts that made sense, that they remembered, and that they could apply. Amy learned enough about the course concepts the first time she took the statistics course for her to build on them and fill in the gaps the second time she took the course. Amy's learning failures in the course did not signify that she had not learned anything, only that she had failed to learn as much as she initially intended to. Similarly, Jason was able to recall details about several of the topics covered in the chemistry course, but he did not learn them as well as he intended to learn them. He did not do well on the exams in the

chemistry course because he could not recall or apply the course concepts. Both Amy and Jason's understanding of the course concepts was fragmentary. Learning failures do not represent a complete lack of learning in the course. Rather, they represent course concepts students intend to learn but do not for one reason or another.

Another insight about the identification of learning failures is that the nature of the course concepts and how they are assessed may affect how students identify and evaluate their learning failures. Jason identified his learning failures in the ASL course when the instructor called on him to demonstrate his communication skills through a public exchange of information. By contrast, Jason identified his learning failures in the chemistry course most often by receiving poor results on course exams or by his inability to reason through homework problems. Amy identified her learning failures in the statistics course in part when she discovered the discrepancies between concept definitions she was learning in the course and definitions she was finding on Wikipedia. This difference in the identification of learning failures demonstrated that the way students interact with course concepts might influence how they identify their learning failures.

Evaluating learning failures. The second key feature of college student learning failures was the way that Amy and Jason struggled to evaluate their learning failures. In the chemistry course in particular, both Amy and Jason struggled to identify what it was that they did not understand about the course concepts. The concepts were just confusing or never made sense to them. Amy explained how she never felt like she really understood the course concepts, they just become "less confusing" to her. Jason, likewise, struggled to understand the foundational concepts in the chemistry course, but could not understand why they were so difficult for him. He struggled to see the relationships between the concepts as well as understand the concepts

themselves. The information he was receiving in the lectures did not transfer to his experiences in the lab sections. He struggled to see how the course concepts related to his career goals as well as to his previous experiences in math and science courses. Through the interviews for this study, it became apparent that neither Amy nor Jason ever figured out why they had such a difficult time understanding the concepts in the chemistry course.

A student's capacity to evaluate their learning failures may also be critical to their capacity to resolve their learning failures. Without the ability to analyze their learning deficiencies or to evaluate reasons for poor performance, students will be incapable of resolving their learning failures. Amy shared her experience overcoming her learning failures in the statistics course. She specifically credits the help of TA's in the course who worked with her to help her identify the gaps in her understanding and to answer her questions about course concepts. Without the help of the course TA's to evaluate her learning failures in the course, Amy would not have been able to resolve the failures. In the other three cases both Amy and Jason expressed their struggles to evaluate their learning failures and how the lack of guidance from instructors, TA's, and peers contributed to their learning failures.

Meyer and Land's (2006) research on troublesome knowledge provides additional insight into the difficulties students sometimes have evaluating their learning failures. According to Meyer and Land, concepts may be troublesome to students when they are transformative, alien, counterintuitive, or incoherent. Concepts that require a student to transform the way they think about the world or about themselves may require more effort to understand than a student is willing to make. When those concepts are so foreign or alien to what the student has experienced, they may also be required to make efforts to change that are beyond what they are comfortable doing. When concepts are counterintuitive or incoherent, students may be ill

equipped to make sense of them. These qualities of course concepts make them troublesome for the student to understand and learn. The troublesomeness of certain course concepts may make it difficult for students to evaluate their learning failures. Several times in his reflections on his learning failures in the chemistry course, Jason explained how several concepts were easy, but then they got hard. He also explained how some concepts should have been easy but were really hard to understand. These vague attempts to evaluate his failures suggest that there were several concepts in the chemistry course that were troublesome for Jason.

The perceived difficulty of the learning failure plays a critical role in a student's decision whether or not to resolve it. Both Amy and Jason switched their majors to avoid having to take and pass the chemistry course. They both perceived that the course concepts were too difficult for them to understand and so they both made the decision to avoid resolving their learning failures in the course. By contrast, Amy was able to get help from the TA's in her statistics course the second time she took it that helped change her perspectives on the difficulty of the course concepts. They were able to help her evaluate the difficulty of the course concepts in a different way that led to her change in attitude about them. Whether or not students choose to resolve their learning failures may depend on how they evaluate their ability to resolve them. Some learners attribute their learning failures to ability, while others attribute them to other factors. Diener and Dweck (1978), in their experiments with learned helplessness explained how some learners "attribute failure to lack of ability, while others attribute failure to motivational factors" (p. 940). In other words, the perception of the student about what caused their learning failure is a critical component in the evaluation of the failure.

The nature and severity of a student's learning failure experiences influences the degree of their reflection on those experiences. Both Amy and Jason provided significantly more detail

about their learning failures in the chemistry course because those failures made a stronger emotional impression on them. Amy felt shame and embarrassment about not being able to pass the course. Jason felt frustration and regret at having to change his major to avoid the course. These strong emotional responses led them both to reflect more on their learning failures in the course in an effort to achieve closure to the experiences. Even though the learning failures took places months prior to this study, neither Amy nor Jason appeared to have completely understood all that contributed to their learning failures in the course. However, this reflection on their learning failures did have positive benefits for Amy and Jason. Learning failures do not always produce negative effects in learners. Some learning failures may motivate students to try harder to learn. In her research on constructive failure, Clifford (1984) suggested that learning failures could result in "increased persistence, task initiation, task resumption, free time devoted to task, and an eventual - though not necessarily immediate - increase in task performance" while noting "that failure is not expected to produce feelings of satisfaction" (p. 109). Learning failures are often difficult to resolve and may often carry some unpleasantness with them. However, they may also generate internal motivation within students.

Attributions for learning failures. The third key feature of college student learning failures relates to Amy and Jason's causal attributions for their learning failures. Amy and Jason both exhibited a predominantly effort-oriented attribution for their learning failures. This effort orientation may be the result of university culture. When a student is admitted to a university, they are expected to already have the learning skills needed to be successful. If they do not, then they are labeled deficient. They are advised to take remediation courses to help them with their reading, writing, critical thinking, logical reasoning, or any other college-appropriate skill. The university culture that emphasizes self-reliance and completion over help-seeking and

collaboration reinforces an effort attribution orientation. Weiner's (2010) research on attribution theory was also a significant part of the review of academic literature for this study. He explained how "attribution intervention or reattribution training has resulted in behavioral change" (p. 35). Additionally he expressed, "Stable beliefs about the causes of failure are important impediments to motivation, whereas unstable ascriptions for failure result in hope, which facilitates motivation" (p. 35). Although an isolated incident in this study, Amy's resolution of her learning failures in the statistics course required a fundamental shift in her attributions for the failures. Initially she tried to learn the course concepts on her own, but failed to do so. She readily ascribed her learning failures in the course to her lack of ability. However, through the support and assistance of the TA's and her peers the second time she took the course, Amy was able to resolve her learning failures. This demonstrated the influence attributions have on students' ability to evaluate and resolve their learning failures.

Additionally, students may superficially attribute their learning failures to the difficulty of a particular concept. As part of his difficulty evaluating his learning failures, Jason superficially blamed the math component of concepts for making the chemistry course incomprehensible. He explained that he felt he was bad at math, but the math component of the course was relatively simple. Math anxiety is a common struggle for college students in science courses and Jason may have been using this popular excuse for his failure to understand the concepts in the chemistry course. It also could have been that math had been troublesome for Jason in the past, so it was a ready excuse for his learning failures in the chemistry course. He struggled to define anything complicated or troublesome about the math component of the chemistry course other than it was difficult for him. Most likely, the problem was not the math component of the course, but rather the manipulating of numbers and staying organized when

working through a problem. For Jason, working with numbers was synonymous with math and because he didn't understand the course concepts, he got confused when trying to work with them in any applied situation. There were several possible reasons for Jason's learning failures in the chemistry course, but he chose to emphasize his difficulties with math.

Furthermore, students' learning failures are often attributable to a range of causes, not just a single cause. Amy and Jason both pointed out their lack of time management skills, which contributed to the learning failures in their courses. There was a lack of interest at times when Amy and Jason struggled to relate the course concepts to something they were familiar with or expected to be doing in their future careers. Additionally, these attitudes changed throughout the courses as Amy and Jason had different experiences with the course concepts, their peers, TA's, the instructor, and learning failure. The causal attributions for their failures were shaped by Amy and Jason's experiences in the courses as well as their past experiences prior to taking the courses.

Self-discovery through learning failure. The fourth key feature of college student learning failures was the self-discoveries that Amy and Jason made about themselves. Their decision to switch majors because of their learning failures in the chemistry course were not solely motivated by a desire to avoid the course in the future. They both took the opportunity to evaluate their future career goals and to develop new goals more aligned with their preferences. These learning failures are an important part of the self-discovery process. They lead students to consider their motives, goals, and expectations, as well as to reform them in light of their learning failures. It may be that some students fail to resolve their learning failures because they choose instead to revise their goals. Learning failures create an opportunity for students to become more self-aware and to learn more about themselves. Amy attempted to take the

chemistry course three times. Each time, her self-doubts led her to disengage from the course. She also explained how her “pride issues” got in her way of asking for help. As a result of her learning failures, she realized that her efforts alone were not going to enable her to understand the course concepts. She would have to overcome her social anxieties and get repeated help in the course. Although she recognized this about her experience, she never sought the help she needed to pass the chemistry course. By contrast, she did decide to get help in the statistics course and was able to resolve her learning failures. Jason also learned that he prefers to deal with math and science concepts in more informal ways. By changing his major to something with less emphasis on math and science, he was able to enjoy those subjects more. Jason’s learning failures helped him become more self-aware and confident of his preferences, his strengths and weaknesses, and his future career aspirations.

When students become more self-aware they become more capable of self-regulating their learning experiences and resolving their learning failures. In their research on self-regulated learning Zimmerman and Pons (1986) explained, "By self-regulated learning strategy we mean actions directed at acquiring information or skill that involve agency, purpose (goals), and instrumentality self-perceptions by a learner" (p. 615). This definition of self-regulated learning suggests that students must become aware of these strategies in order to use them to self-regulate their experiences. Resolving learning failures changes student perceptions and attitudes about course concepts and about their capacity to accomplish future learning goals. Amy had persistent shame and embarrassment about her unresolved learning failures in the chemistry course, but very positive feelings about her resolved learning failures in the statistics course. Although Jason minimized his learning failures in both the chemistry and the ASL courses, he was still frustrated

about them. These emotional responses to their learning failures suggested the differing degrees of self-awareness that both Amy and Jason developed in consequence of their learning failures.

Past experience and future expectations. The fifth key feature of college student learning failures relates to the influence Amy and Jason's past experiences had on their failures, as well as the influence their failures had on their future expectations. Even though months had passed since Jason's learning failures in the chemistry course, they still bothered him and created an aversion in him to math and science courses in the future. Students' past experiences influence their expectations and learning goals for their courses and affect how they identify their failures in a course. These past experiences motivate and create expectations for the course learning experiences that influence how students experience their learning failures in a course. As an example, Jason's initial motivation to learn ASL was to talk to his friend Kenny from Micronesia. He had tried to communicate with him using a combination of sign language and loud speaking, but was frustrated when he found he could not. Jason's initial experiences with Kenny helped him create expectations for the course and to set learning goals. However, his frustration as an initial motivator to take the course was not strong enough for him to persist in the course and learn ASL grammar. It may be that Jason's initial motivation became weak because the object of his motivation was removed both temporally and geographically. Jason's encounter with Kenny took place in the past in a remote part of the world. The experience was enough to motivate Jason to take the ASL course and to intend to learn ASL grammar, but it was not sufficient to prevent his learning failures in the course. Furthermore, Jason revised his initial learning goals in light of the fact that he struggled to learn ASL grammar. Instead of deciding to resolve his learning failures, he reasoned that he no longer needed to learn ASL grammar like he had initially intended to do.

Students' learning goals, career goals, and expectations for their courses create the conditions for their learning failure experiences. A student's concept of the activities he or she will be doing in the future may motivate them to persist through their learning failures until they are resolved. Expectations for future activities, like past experience, serve as a basis for learning course concepts. If students have a vague understanding of the relation between course concepts and expected future activities, it becomes difficult for them to understand the concepts and learning failures ensue. Jason's goal to become a PA/PT required that he learn the concepts in the chemistry course. However, he struggled to see the relationship between his expectations of the professional activities of a PA/PT and the course concepts. The explanations of course concepts by the instructor would help Jason make those connections at times, but for the most part, he could not see the connection. Had there been more instruction that defined clear ties between course concepts and Jason's expected future activities, he probably would have had more success in the course and in his original major. It could also be that his learning failures in the chemistry course helped Jason to clarify that he did not want to engage in the professional activities of a PA/PT.

Learning failures also influence the clarification and revision of students' future goals. Rychlak (1986) in his research on logical learning theory proposed the very useful concept of telosponsivity. He explained that, "A telosponse is a cognitive process in which the reasoning agent (person, self, etc.) premises (involving predication) a meaningful item (image, language term, judgmental comparison, etc.) acting as a purpose for the sake of which behavior is then intended" (p. 741). This definition suggests that students acting as agents develop learning and career goals in an effort to bring about some desirable future state of being. In this study, Amy continued to struggle with her learning failures in the chemistry course until she came to a point

where she decided to completely revise her learning goals by changing her major. This change required her to change her expectations for her future career activities. When students make the decision not to resolve their learning failures, they also make the decision to revise their expectations for their future career activities. These points suggest that Rychlak's concept of telosponsivity plays a significant role both in students' evaluation of their learning failures and in their resolution. Additionally, these points suggest that students' past experiences and future expectations are significantly influenced by their learning failure experiences.

Social influence. The sixth key feature of college student learning failures is the way relationships and social expectations contributed to Amy and Jason's failures. The learning failures Amy and Jason described in this study were all heavily influenced by their social interactions, expectations and relationships or the lack thereof. Amy's learning failures in the chemistry and the statistics courses demonstrate the strongest social contrast. The key to her resolution of her learning failures in the statistics course was the same reason for her learning failures going unresolved in the chemistry course. She had strong, safe social relationships and interactions with the TA's and her peers in the statistics course that enabled her help-seeking behaviors when she needed it. She felt like a "little person" in relation to her peers, the TA's, and the instructor in the chemistry course. This feeling of social anxiety and inadequacy impeded her help-seeking behaviors. It may have been that Amy's strong effort-orientation also prevented her from getting the help she needed to resolve her learning failures. However, she was able to realize in the statistics course that her own efforts to resolve her learning failures were inadequate. This point demonstrates the potential influence social relationships and interactions have on the modification of students' personal attribution orientations. As Amy modified her

effort orientation in the statistics course because of the supportive social environment, she was able to resolve her learning failures.

Students may also justify their learning failures and their decision whether or not to resolve them based on relative learning failures of others around them. Justifying learning failures based on the experiences of others or minimizing their meaning and importance for future experiences may prevent them from being resolved. Jason's learning failures in both the chemistry and the ASL courses demonstrated how his social relationships and interactions led him to the decision to not resolve his learning failures in the courses. In the chemistry course, Jason shared the experiences of one of his classmates and her decision to change her major because of her learning failures in the course. In the ASL course, Jason shared the experiences of a whole group of students that made the same decision he did to forego taking future ASL courses. Jason used these experiences of his trusted peers to justify his own decisions regarding the resolution of his learning failures. This point suggests that students' social relationships and interactions strongly influence their learning failures and the decision whether or not to resolve them.

The types of social relationships that students have with peers, TA's, and instructors influence how they experience their learning failures. In their research on situated learning, Lave and Wenger (1991)defined a community of practice as, "a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice" (p. 98). Within this idea of communities of practice, Lave and Wenger also expressed that, "Learning viewed as situated activity has as its central defining characteristic a process that we call legitimate peripheral participation. By this we mean to draw attention to the point that learners inevitably participate in communities of practitioners and that the mastery of

knowledge and skill requires newcomers to move toward full participation in the sociocultural practices of a community (p. 29).The nature of relationships with peers, TA's, and the course instructor can contribute to both students' learning failures and to their resolution. Mentors who can help students see relationships between expected future activities and course concepts may be able to encourage students to work through their learning failures. As was the case with Amy in the statistics course, she abandoned the ideas of communities outside of the classroom like Wikipedia, and chose to focus on the practices, concepts, and definitions within the course. This led her to more fully adopt or acquire an understanding that to being able to resolve her learning failures in the course. These insights suggest that these course-level communities of practice and the nature of students' participation within the communities significantly influence student learning failures and their resolution.

Implications for Future Research

This focus of this study was extremely broad due to the lack of existing research on college students' perspectives about their learning failures. There was neither a cohesive body of literature to draw on nor any previous studies to replicate. As such, this study was designed to expand on the existing themes in the several literatures reviewed and to set a precedent method for conducting future studies on the topic of college student learning failures. Ideally future studies on college student learning failure experiences would have a much narrower focus on a particular aspect of the experiences. Additionally, it would be helpful as more research is conducted on this topic if an organizing framework of ideas were generated to help researchers compare and communicate their findings regarding college student learning failures. This study has introduced a rudimentary framework based on the themes and assertions that emerged from the analyses of the cases. This framework consists of the following areas: Recognizing learning

failures, Evaluating learning failures, Attributions for learning failures, Self-discovery through learning failure, Past experience and future expectations, and Social influence. It is expected that with future research, this framework will expand and change. Some key research questions for the future include:

1. How do students identify their learning failures?
2. How do students define their learning failures?
3. How do students work through and resolve their learning failures?
4. How do students' attributions for their learning failures change through dialogue?
5. What do students learn about themselves through learning failure?
6. How do students' learning goals affect their learning failures?
7. How do students' learning failure experiences influence the revision of their learning goals and future expectations?
8. How do social relationships contribute to learning failures and their resolution?

Implications for Practitioners

As a result of this study, recommendations for college professors, instructional designers, and academic counselors were generated. These recommendations are based on the limited experiences of Amy and Jason as reported in this study. The recommendations are suggestions that must be adapted to the individual circumstances and contexts in which the college professors and instructional designers find themselves. The following list of recommendations outlines the suggestions:

1. Discuss with students in a course about typical ways students fail in the course.
2. Help the students clearly identify their learning failures.
3. Help students clearly evaluate their learning failures.

4. Help students make appropriate attributions for their learning failures.
5. Use learning failure experiences to help students reflect on their learning goals and future expectations and to revise them if needed.
6. Help students to develop appropriate expectations for their future career activities.
7. Help students form supportive relationships with peers, TA's, and course instructors.

Discuss with students in a course about typical ways students fail in the course. At the beginning of a college course, it would be helpful to students to be made aware of the typical ways they might struggle with the course concepts. This should be done in a very specific way, with reference to particular course concepts, perhaps by sharing experiences from former students. In an asynchronous learning environment, this could be achieved by introducing the learner to the course content and the ways that other students have struggled with particular course concepts in the past. There should be attention to particularly difficult concepts and applications with suggested learning strategies to overcome the difficulties. This will prepare students ahead of time for their inevitable learning failures, thus giving them a greater likelihood of resolving their learning failures.

Help the students clearly identify their learning failures. When students do experience learning failures in a course, help them to quickly identify that it has occurred. This can be done in a variety of ways including regular assessments, public performances, dialogue about course concepts, etc. In an asynchronous learning environment, this could be achieved through the inclusion of regular quizzes, student discussion forums in which students share their understanding of concepts and receive feedback, and assigning students to teach particular concepts to classmates. This should be all be done in a non-threatening way to reduce the social anxiety some students may feel regarding their learning failures.

Help students clearly evaluate their learning failures. Provide regular support and opportunities for students to discuss their learning failures with TA's and course instructors. Students may lack the capacity to clearly and metacognitively evaluate their learning failures on their own. This co-evaluation process with TA's and course instructors could include training the student to ask better questions about their learning failures. In an asynchronous learning environment, this could take place via discussion boards where students post their questions, in direct communication with professors, or through the assignment of individual tutors or mentors for each student. Helping students ask better questions about their experiences may help them clarify the difficulties they are having with specific course concepts.

Help students make appropriate attributions for their learning failures. In university environments, it may be difficult for some students to ask for the help they need to resolve their learning failures because of the importance that is placed on their individual efforts. Help students to clearly identify the roles of professors and TA's and to identify additional academic resources that could help them resolve their learning failures. It may also be helpful to mentor students to develop appropriate expectations for success in the university environment. Some students may decide not to resolve their learning failures because they inappropriately attribute their learning failures to a lack of ability rather than a lack of time, interest, or effort. In an asynchronous learning environment, this could be achieved by incorporating existing attribution assessment instruments and regular messages of encouragement from professors and peers. Appropriate attributions for learning failures can help students more productively work through their learning failures.

Use learning failure experiences to help students reflect on their learning goals and future expectations and to revise them if needed. As students experience their learning

failures, it may be helpful to encourage them to keep a reflective journal. In this journal, they could record questions, impressions, and insights about their failure experiences. They could also be encouraged to regularly reflect on their learning goals for their courses as well as their expectations for future career activities. In an asynchronous learning environment, this could be achieved by requiring students to develop a personal learning environment online, which may consist of a blog, a wiki, a website, or some other free journaling software available on the Internet. Through the process of reflection, students may be encouraged to better align their goals and expectations with the experiences they have in their courses, both the successes and the failures. Better alignment between experiences and expectations may help students develop more engagement in their courses.

Help students to develop appropriate expectations for their future career activities. When students take courses that are designed to prepare them for future career activities, it may be helpful at the beginning of a course to help them develop appropriate expectations. This may include a brief review of students' career goals and expectations. It could include a dialogue about career activities or a guest presentation from practitioners in the fields related to the course. It may be helpful to have an internship component to the course assignments that helps students to interact with professionals in their expected career field. Students may also be assigned practitioner mentors that are able to help the student make connections between future career activities and course concepts. In an asynchronous learning environment, this could be achieved by creating an introductory survey to which students respond with their career interests and expectations. Students in these environments could also be connected with a professional or mentor in the field of their interest who can answer basic questions about course content and provide realistic perspectives about professional activities.

Help students form supportive relationships with peers, TA's, and course instructors. When possible, help students to establish small workgroups with peers that work together on assignments. It may also be helpful to create regular opportunities for small groups of students to meet with TA's and course instructors to dialogue more about their understanding of course concepts. These small, safe group interactions may help more easily discover the flaws in their understanding and get help resolving their learning failures. The smaller group format will also help develop stronger relationships of trust among students, TA's, and course instructors. These relationships may help students be more willing to discuss and evaluate their learning failures openly in an effort to resolve them. Additionally, a course structure that supports small group interactions and regular dialogue rather than strictly individual assignments and lecture can help reduce the social anxiety of some students and encourage them to get the help they need to resolve their learning failures. In an asynchronous learning environment, these strategies can be employed by assigning students to small workgroups based on student interests or characteristics. The group social structure can also be enhanced through assignments that help students get to know one another's strengths and weaknesses and require the assignment of meaningful roles within the group. The groups in this learning environment should hold regularly scheduled meetings in which each member shares and records insights and works with other members on assigned projects.

Study Limitations

The primary limitation of this study was a lack of precedent. Although learning failure is a ubiquitous experience in education, there is no corpus of literature specifically dedicated to its study. As such, there were significant limitations to this study in the literature review, research

questions, participant sampling, study invitations, participant selection, data gathering and management, transcription, data analysis, and the originally proposed schedule.

Literature review. Due to the fact that learning failure is not a common term in the academic literature reviewed for this study, alternative terms were used for the literature search. Due to the fact that different terms were used, the literature search was too broad and returned a large number of results that did not directly relate to this study of college student learning failures. Therefore, it became necessary to define strict selection criteria for those articles that would be included in the review. Once these criteria were applied, it became clear that no article or study existed that could provide a precedent for this study. The literature was then reviewed for the purpose of identifying a range of themes and methods that existed in similar studies that could be used as reference points in the design of this study. As more research is conducted regarding college student learning failures, it is expected that a more coherent body of literature on the topic will emerge, making a review of various methods and findings more accessible to researchers.

Research questions. As there was no precedent study to build from for this study, the research questions were broad and exploratory in nature. This led to a lack of focus throughout the study, which in turn greatly increased its length. It is expected that the findings and methods from this study will establish a precedent for research into college student learning failures that will help focus future research questions.

Participant sampling. This study used a critical case sampling approach for the identification of initial study participants as outlined by Patton (1990). This sampling approach was used because the purpose of the study was to develop and expand on themes dealing with underspecified learning failure experiences. Therefore, criteria were established for defining

critical cases of learning failure that would enable the researcher to gather the data needed to establish the study cases for analysis. This set of criteria was vague and focused primarily on the ability of participants to reflectively articulate their experiences with enough detail to compile the cases. With the findings generated by this study and more focused research questions in the future, it is expected that stricter criteria for participant sampling would be employed.

Study invitations. Due to a lack of precedent research on college student learning failures and initially vague definitions of learning failure, it was difficult to articulate to faculty and students what would be required of their participation in the study. The study invitations that went out to students simply requested that they make themselves available to discuss their difficult learning experiences and that they be willing to meet multiple times. Due to the vague nature of the invitation, the initial response rate was limited, with several participants failing to meet the needs of the study. In future research, study invitations will provide clearer definitions of learning failure experiences along with better approximations for time and frequency of participation commitments.

Participant selection. The exploratory nature of this study made it difficult to explicitly define criteria for participant selection. After introductory interviews with all initial participants, two participants were selected to more fully share their experiences. As a result of the findings in this study, clearer participant selection criteria can be established that will greatly simplify the selection process.

Data gathering and management. Several technology options for gathering, recording, and storing data for this study were used in the absence of clear recommendations from colleagues in the academic community. As a result, multiple software tools and recording devices were used throughout this study. In future studies, insights about data gathering and data

management from this study will help define best practices and tools that will dramatically simplify the process.

Transcription. Transcription took much longer than expected and different tools were used to accomplish it. The transcription protocol used was specifically adapted for this study and will simplify the process in future studies. Additionally, two different dictation software tools were used and compared: Nuance's Dragon Naturally Speaking software and Apple's built-in Dictation tool. The Dragon tool was helpful because it did not require an Internet connection to use. However, the Apple Dictation tool was faster and more accurate than the Dragon tool. As a result, the apple Dictation tool was used for a majority of the transcription work in this study. This identification of a superior transcription tool will simplify the transcription process for future studies.

Data analysis. This study followed Stake's Multiple-Case Study (2006) approach because its emphasis on the exploration of a range of themes across contexts directly aligned with the research questions and purposes of this study. However, Stake's approach focused mainly on a program evaluation context, which made it necessary to adapt his method to fit the purposes of this study. The primary adaptations related to the use of the data analysis worksheets described in his approach. The results from this study can lead to the development of new worksheets that better align with a multiple-case study approach to studying college student learning failures in the future.

Schedule. The original schedule proposed for the study was too conservative in its estimates of how long each component would take. The poor estimates were due mainly to the underspecified nature of the learning failure experiences being studied and the researcher's lack of experience with qualitative research. Specifically, the transcription and data analysis process

took much longer than anticipated. Additionally, the study was augmented after its initial approval by the addition of another participant for the purpose of further comparison of themes. This decision tripled the amount of analysis required, which affected every other component of the study. The results of this study will provide benchmarks for estimates of time commitments and schedules in future studies.

Intended Audience

The intended audience for this manuscript was the academic research community. While implications for practice were included in the discussion of findings, it was anticipated that a separate manuscript would be written to address the needs of a practitioner audience. Two venues for publication of this manuscript were intended: The American Educational Research Journal and Research in Higher Education. Both journals publish articles similar in nature to the questions on learning failure explored in this study. Each journal has a different readership and emphasis; The American Educational Research Journal has a broader research focus, while Research in Higher Education focuses specifically on the higher education context. This manuscript would align well with the aims and scope of either journal. This manuscript with its emphasis on the college student context of learning failure experiences, together with the academic tone also make it suitable for publication to either of these two journals.

Conclusion

The purpose of this study was to explore how college students reflectively describe their learning failure experiences, along with the major themes of those experiences. Through a series of in-depth interviews, four narrative cases written from the perspective of two college students were developed. These four cases were then carefully analyzed and cross-examined to generate a deeper understanding of college student learning failures. This study explored approximately 78

themes related to these four cases, which led to the development of six categories of college student learning failure experiences: Recognizing learning failures, Evaluating learning failures, Attributions for learning failures, Self-discovery through learning failure, Past experience and future expectations, and Social influence. These components helped to define an initial framework for guiding future research into college student learning failure experiences.

This study also serves as a precedent for future multi-case studies on college student learning failures. Its research questions focused on creating a broad understanding and definition for learning failure experiences that may contribute to more focused, exploratory research in the future. Additionally, the methods for this study were adapted from several other sources which pioneered better ways to collect, manage, and analyze data for similar studies in the future. The findings from this study seek to improve the understanding and practice of researchers and practitioners alike regarding college student learning failure experiences. Learning failures are a ubiquitous part of education. They are transformational on several levels. By developing a better understanding of these critical experiences, students can be better assisted to work through their learning failures and accomplish their learning goals.

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APPENDIX A: Review of Literature

Studies relating to learning failure have been present in education literature for several years. Quantitative studies have dominated the learning failure literature over the past four decades, with most findings being characterized in terms of interaction effects and correlations (Bailey, Helm, & Gladstone, 1975; Bayton & Whyte, 1950; Buck & Scammon, 1966; Chen, Chen, Lin, Kee, & Shui, 2009; Chen, Wu, Kee, Lin, & Shui, 2009; De Soto, Coleman, & Putnam, 1960; Peetsma, 2000; Schlenker, 1975; Seli, Dembo, & Crocker, 2009; Smith, Ryan, & Diggins, 1972; Struthers, Menec, Schonwetter, & Perry 1996; Wei & Ku, 2007). In qualitative research, case studies were the predominant approach for exploring learning failure. These case studies typically came from interviews with students and from the self-reflections of the researcher (Cox, 2009; Matson, 1991; Taylor, 2008). While this body of research has generated many contextualized insights into learning failure, there were no studies that explore how students experience and work through their failures from their own point of view. Additionally, the learning failures were too often reduced to the point of oversimplification by operationalization — without the attempt to understand their complexity and dynamic nature. Through a series of interviews in the present study, multiple cases of learning failure were developed and analyzed in a way that can improve our understanding of the complexities of learning failures. An understanding of learning failure experiences — from the student perspective, can lead to improved instructional design and pedagogical practice.

In conducting the literature search for this review, it was important that the results returned would reflect rigorous, scholarly inquiry. Unfortunately, learning failure is not a term that is common in education and psychology literature. As a result, it was necessary to identify appropriate search terms that returned literature that specifically dealt with learning failure

experiences. Furthermore, it was necessary to limit the target populations of the returned studies to make the review both feasible and coherent. From these constraints, three main criteria points for searching the literature were used. First, the literature returned had to be peer-reviewed. Second, the search terms had to return articles that discussed learning failure experiences and not general failures or other unrelated constructs. Third, the terms had to target college student populations. Based on these criteria, the search terms failure and college students were utilized using EBSCOHost databases. This literature search returned approximately forty-nine articles for review.

The literature consisted of approximately seventy percent quantitative research studies that used statistical analysis to detect or explain an experimental effect. The qualitative studies in the review used case studies almost exclusively to explore students' learning failures. Additionally, the literature was characterized by two prominent constructs. The first was fear of failure, which accounted for over half of the studies reviewed. The second was attributions for failures, which represented approximately one-quarter of the literature reviewed. Other constructs included achievement, motivation, college dropouts, failure avoidance, cognitive failure, business failure, and computer assisted instruction failures. It can be argued that these additional constructs are really subsets of fear of failure and attribution, but due their specific emphasis in the studies, they have been categorized as separate constructs.

Quantitative Research

The academic literature about college student learning failure mainly consists of quantitative studies that are limited in the diversity of their samples and in the constructs being studied. The purpose of these quantitative studies is to identify factors and correlations for the intent to predict and control students' learning failure experiences. While these studies provide

valuable insights into learning failures among limited populations, these findings are not as generalizable as has been claimed (Seli, Dembo & Crocker, 2009). Most often, the findings only apply to the populations of each study, which limits their value to the broader spectrum of instructional practitioners and researchers. More importantly, these studies offer no insight into how students experience and cope with their learning failures.

In the quantitative studies reviewed, learning failure was intimately associated with learning experiences and only had to be experimentally induced when the inducement itself was being studied (McClelland & Apicella, 1945; Cruz Perez, 1973; Truax & Martin, 1957). In other words, the learning failures that were explored occurred naturally as the result of students' authentic learning experiences. The failures were not anomalies tangential to the learning experiences — they were an inherent part of learning. Unfortunately, none of the studies pursued this theme of failure in learning beyond the initial identification of the failure.

Learning failures were also found to influence future learning experiences. Struthers, Menec, Schonwetter, and Perry (1996), in their research on the correlations between attribution for learning failure and creativity, found that student attributions for past failures may be stable or unstable and can influence motivation and achievement in the future (p. 137). Additionally, Kornell, Hays, and Bjork (2009), in their study of unsuccessful retrieval of learned concepts, found that the degree to which students fail also influences how and what they learn (p. 997). This is a major finding because it furthers the argument for failures being a core part of the learning experience. Failures, in this sense, would not be ancillary to learning, but a major theme affecting learning outcomes. Exactly how future learning experiences are affected by students' causal attributions was not unexplored.

From research done by Ellett and Chadwick (2007) on the correlation of learning failure experiences with self-aware behaviors, it was found that learning failure might induce depression, but not paranoia. It was not clear from this research, however, how the learning failures induced the depression or whether the depression was due, in part, to other factors. Kureshi, Ali Khan, and Singh (1980), in their study of learning failures among Indian populations, also used statistical analysis to detect a correlation between learning failure experiences and strong negative emotions. They additionally identified culture as a powerful factor in these negative responses to failure. Unfortunately, the extent of cultural influence and the reasons for the negative responses to learning failure were not addressed.

These quantitative descriptions of learning failure, while important, are limited in terms of their capacity to describe student experiences holistically. The disparate factors and correlations identified in these research studies are important, but are not clearly related to one another in the literature. There is no qualitative or quantitative exploration of their significance to students or instructors. This lack of a holistic understanding of learning failure experiences fails to produce findings that are meaningful in any context outside of the individual studies themselves. Unfortunately, the quantitative methodologies of these studies have limited our capacity to understand the various themes and complexities of student learning failures. This is due to the fact that these methods are only capable of identifying causal factors and correlations. Therefore, I am proposing that a qualitative exploration of learning failure could be useful for exploring other possible learning failure issues and meanings, especially from the student's perspective.

Qualitative Research

There are a limited number of qualitative studies that explore learning failure in comparison to the number of quantitative studies. Additionally, these qualitative studies often lack the depth of understanding expected from such studies. Quantitative descriptions of the qualitative data make up the bulk of reported findings (Hawi 2010). These qualitative studies also tend to reduce learning failure to oversimplified operationalizations, such as the number of times a student uses certain words, phrases, or gestures. For these reasons, I suggest that a more thorough, descriptive exploration of college student learning failure experiences is necessary. The purpose of this research study is to develop a better understanding of learning failure experiences by exploring critical issues from the student perspective and documenting the highly complex and contextual nature of these experiences. This improved understanding of learning failure will lead to better research and practice in the future.

Case study research was the predominant qualitative approach in the learning failure literature. The other, less utilized methodology was grounded theory (Mercer, 2010). The case studies in the reviewed research were typically generated from interviews and self-reflections (Cox, 2009; Matson, 1991; Taylor, 2008). The prevalence of case study research in this literature suggests that it may be the most favorable method for qualitatively exploring and describing how students experience their learning failures. There was a great degree of flexibility in the way that the case studies were analyzed and interpreted, which made them highly suitable for exploring multiple themes and issues. The study made by Hawi (2010) of students' causal attributions for failure in an introductory computer programming class consisted of participant interviews that were then analyzed by counting the frequencies of specific attributions in the interview transcripts. These counts were then used to rank the prevalence of certain attributions that were

present in the study (p. 1129). Hawi's research could be classified as letting a single student's set of attributions represent a case. By contrast, Cox (2009) generated cases from interviews with faculty and students that were then analyzed and categorized based on the theoretical frameworks of researchers Clark and Goffman respecting fear of failure and causal attribution (p. 59). From this comparison, we can see that the flexibility in the analysis and interpretation of the cases allowed the researchers to reach very different conclusions. This is a feature of the case study methodology that can help researchers contextualize their approach to the phenomenon being explored. In these studies, the findings from both studies were unique, but both failed to account for the students' perspective on the learning failure experiences. The data gathering was focused, in both cases, on the validation or refutation of preconceived hypothesis of past researchers. While the findings of this research were valuable, they were limited in their capacity to provide insight into the student experience of learning failure.

Another study in the review utilized a grounded theory approach to learning failure. Mercer (2010) worked with twenty college students and explored the connections between several different factors and their influence on student experience. In describing a male student's experience with learning failure, she highlighted how the experience had influenced his identity by stating, "For him there was a dissonance between the fact that he had been labeled an academic failure and his own belief that he was capable of academic achievements" (p. 30). In other words, the learning failure experiences this student had gone through generated labels that seemed at odds with his own self-conception. This dilemma further underscored the power of learning failure experiences to deeply influence learners and illustrated their centrality to the experience of learning. Unfortunately, there was no exploration of how learning failures actually affect future learning, nor was there any detail as to how learners experienced the failure — only

that it happened. While Mercer discussed several themes that emerged in her research, there was no indication that she had developed a cohesive, grounded theory about learning failures. As such, her discussion yielded a list of insights without a real connection between them. The use of quotes in the research report appeared more to focus on individual student cases and interviews than on supporting or developing a grounded theory. From this example it appears that case study approach to exploring learning failure, and perhaps qualitative research in general, is the more natural approach.

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APPENDIX B: Study Participation Invitation Email

Recruitment Email

Dear (Student),

A research study exploring difficult college learning experiences is being conducted by **Keith Proctor, a PhD student** at Brigham Young University, under the direction of **Stephen Yanchar, PhD.**, faculty mentor in the BYU college of Instructional Psychology and Technology. This study is designed to explore how college students experience difficult learning experiences, including ones that result in poor grades for assignments or the class as a whole. You are invited to participate in this study because of your experience with difficult learning experiences at Brigham Young University**.**

Participation in this research study will include the following:

- you may be asked to submit work samples to illustrate your learning experiences
- you will be interviewed multiple times for approximately thirty to sixty(30 - 60) minutes each time about your learning experiences at BYU.
- the interviews will be audio recorded to ensure accuracy in reporting your statements. Quotes from the interviews will be used in research reports based on this study. All quotes will be anonymous.
- the interviews will take place on BYU campus at a time convenient for you.
- the researcher will contact you multiple times throughout the study for approximately thirty (30) minutes each time to check the accuracy of developing themes and insights from the interviews (member checks).
- total number of interviews is planned to be three or such.

You may feel some embarrassment when answering questions about your learning experiences or when being audio recorded. If you feel embarrassed about answering a particular question, you may choose to decline or excuse yourself from the study without any consequence. There will be no direct benefits to you. It is hoped, however, that through your participation researchers may learn about difficult college learning experiences and may be able to assist struggling students to improve their future learning experiences. Although you will not receive any material

compensation for participation in this study, past participants have stated that their participation helped them to understand themselves and their learning experiences in new ways that led to growth and success in learning.

Participation in this research study is completely voluntary. You will have the right to withdraw at any time or refuse to participate entirely without jeopardy to your class status, grade, or standing with the university.

If you would like to participate in this study, please contact Keith Proctor directly at Keith.Proctor@byu.edu. Thank you.

APPENDIX C: Initial Participant Consent Form

Consent to be a Research Subject

Introduction

This research study is being conducted by **Keith Proctor, a PhD student** at Brigham Young University, under the direction of **Stephen Yanchar, PhD.**, faculty mentor in the BYU college of Instructional Psychology and Technology. This study is designed to explore how college students experience difficult learning experiences, including ones that result in poor grades for assignments or the class as a whole. You are invited to participate in this study because of your experience with difficult learning experiences at Brigham Young University**.**

Procedures

If you agree to participate in this research study, the following will occur:

- you may be asked to submit work samples to illustrate your learning experiences
- you will be interviewed multiple times for approximately thirty to sixty(30 - 60) minutes each time about your learning experiences at BYU.
- the interviews will be audio recorded to ensure accuracy in reporting your statements. Quotes from the interviews will be used in research reports based on this study. All quotes will be anonymous.
- the interviews will take place on BYU campus at a time convenient for you.
- the researcher will contact you multiple times throughout the study for approximately thirty (30) minutes each time to check the accuracy of developing themes and insights from the interviews (member checks).
- total number of interviews is planned to be three or such.

Risks/Discomforts

There are minimal risks for participation in this study. You may, however, feel some embarrassment when answering questions about your learning experiences or when being audio recorded. If you feel embarrassed about answering a particular question, you may choose to decline or excuse yourself from the study without any consequence.

Benefits

There will be no direct benefits to you. It is hoped, however, that through your participation researchers may learn about difficult college learning experiences and may be able to assist struggling students to improve their future learning experiences. Additionally, some past participants have stated that their participation helped them to understand themselves and their learning experiences in new ways that led to growth and success in learning.

Confidentiality

The research data will be kept **on a password protected computer** and only the researcher will have access to the data. At the conclusion of the study, all identifying information will be removed and the data will be kept in the researcher's office in a locked **storage cabinet**.

Compensation

You will not receive any material compensation for their participation in this study.

Participation

Participation in this research study is voluntary. You have the right to withdraw at any time or refuse to participate entirely without jeopardy to your class status, grade, or standing with the university.

Questions about the Research

If you have questions regarding this study, you may contact Keith Proctor at Keith.Proctor@byu.edu or Dr. Stephen Yanchar, PhD – supervising faculty member on this study at Stephen_Yanchar@byu.edu.

Questions about Your Rights as Research Participants

If you have questions regarding your rights as a research participant contact IRB Administrator at (801) 422-1461; A-285 ASB, Brigham Young University, Provo, UT 84602; irb@byu.edu.

Statement of Consent

I have read, understood, and received a copy of the above consent and desire of my own free will to participate in this study.

Name (Printed): _____
Signature _____ Date: _____

APPENDIX D: Final Participant Consent Form

Consent to be a Research Subject

Introduction

This research study is being conducted by **Keith Proctor, a PhD student** at Brigham Young University, under the direction of **Stephen Yanchar, PhD.**, faculty mentor in the BYU college of Instructional Psychology and Technology. This study is designed to explore how college students experience difficult learning experiences, including ones that result in poor grades for assignments or the class as a whole. You are invited to participate in this study because of your capacity to articulate and describe your difficult learning experiences at BYU**.**

Procedures

If you agree to participate in this research study, the following will occur:

- you may be asked to submit work samples to illustrate your learning experiences
- you will be interviewed multiple times for approximately 60 minutes each time about your learning experiences at BYU.
- the interviews will be audio recorded to ensure accuracy in reporting your statements. Quotes from the interviews will be used in research reports based on this study. All quotes will be anonymous.
- the interviews will take place on BYU campus at a time convenient for you.
- the researcher will contact you multiple times throughout the study for approximately thirty (30) minutes each time to check the accuracy of developing themes and insights from the interviews (member checks).
- total number of interviews is planned to be about five or more.

Risks/Discomforts

There are minimal risks for participation in this study. You may, however, feel some embarrassment when answering questions about your learning experiences or when being audio recorded. If you feel embarrassed about answering a particular question, you may choose to decline or excuse yourself from the study without any consequence.

Benefits

There will be no direct benefits to you. It is hoped, however, that through your participation researchers may learn about difficult college learning experiences and may be able to assist struggling students to improve their future learning experiences. Additionally, some past participants have stated that their participation helped them to understand themselves and their learning experiences in new ways that led to growth and success in learning.

Confidentiality

The research data will be kept **on a password protected computer** and only the researcher will have access to the data. At the conclusion of the study, all identifying information will be removed and the data will be kept in the researcher's office in a locked **storage cabinet**.

Compensation

You will not receive any material compensation for their participation in this study.

Participation

Participation in this research study is voluntary. You have the right to withdraw at any time or refuse to participate entirely without jeopardy to your class status, grade, or standing with the university.

Questions about the Research

If you have questions regarding this study, you may contact Keith Proctor at Keith.Proctor@byu.edu or Dr. Stephen Yanchar, PhD – supervising faculty member on this study at Stephen_Yanchar@byu.edu.

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Statement of Consent

I have read, understood, and received a copy of the above consent and desire of my own free will to participate in this study.

Name (Printed): _____

Signature _____ Date: _____

APPENDIX E: Audit Trail

Reflexive Journal Entries

Member checking - Jason' Feedback | 9 Jan 2014 (7:58am)

I recently sent the case study themes to Jason for his review and feedback. Here is what he shared:

Hey Keith,
The review was very interesting! I read it through twice just to make sure I caught everything. I think there were definitely some themes that you saw that I never realized or I never even expressed even though they're true. The "learning by guessing" concept for the Chemistry Course Structure theme struck home for me. I got really good at doing that through grade school.

Here's the feedback:
- In the ASL theme of Past Experience, it is stated that "His past experiences continued to frustrate him enough that he wanted to learn ASL." I think "frustrate" isn't the best word there. It was really that the experiences motivated/pushed/persuaded me to set a standard that I later felt disappointment over because I felt I didn't achieve it. I still view it as being more of a positive reinforcement.

- In the Social Difficulties section of the Added Multicase Themes, I would say that I did have personal connections with the students in the PDBIO and ASL classes and even the instructor of the ASL class, but it was generally non-academic to me. I actually did spend time studying in the ASL class and PDBIO class with the students, but it generally reverted to us doing something non-academic (getting something to eat, going on a date, etc.) The ASL teacher was deaf, so my difficulty was in phrasing the right questions, so instead I would just revert to attempting to make small talk with the ASL I did know. I don't know if that changes anything.

That's all I got!
I was grateful for Jason' honest feedback and he confirmed the point that his participation in this study has been revelatory for him. These revelatory experiences have been key throughout the study. Amy has also experienced them. There is something powerful about the analysis of our experience that leads to new understanding of ourselves and hopefully to an increased capacity to work through difficult experiences. I do not know what may happen with Jason at this point relative to his past learning failures, but I believe he has developed insight about himself that will help him in his future learning challenges.

I hope to hear back from Amy about her case themes soon also. I met with Dr. Yanchar yesterday and am preparing the final report for the study, hopefully to be compiled by the end of the month. I will then send out the draft for committee review. From there, we'll have to see what happens. I am confident though that the insights and knowledge generated from this study, if communicated properly, will be of great benefit to the academic and practitioner communities within higher education.

Learning Failures and Knowledge | 18 Dec 2013 (4:05pm)

I have been reading in Bereiter's book "Education and Mind in the Knowledge Age" and have found that the ideas parallel my insights in this learning failure study. He shares a great sketch of three students working through a math problem and the inferences the teacher makes relative to the correct or incorrect response. Bereiter's point is that the imprecise inferences of the teacher are insufficient to lead that teacher to help the student effectively resolve the failure (p.14-15). From my reading of Bereiter's points, I understand his call is to question some of the underlying assumptions associated with the failure in a way that helps us see a greater range of contributory problems. While Bereiter's example focuses on a discrete problem (adding fractions), my study on learning failure is attempting to make the same point from a more foundational level - all learning failure is complex and we are uncritical in our analyses of these experiences. Bereiter suggests that by challenging our "folk theories" of educational experiences, we can become more precise in our thinking and understand them in a way that will improve our rate of innovation and progress. This is a major idea that I am not seeing discussed in the literature I reviewed for this study.

Models and Frameworks | 16 Dec 2013 (10:36am)

Early on in this study, Dr. Gibbons challenged me to clarify the contribution that I would make by this study. He pushed me to identify the form of that contribution. In the defense meeting, I stated that the outcome of the study would be a description of themes related to Learning Failure experiences that are not currently discussed in the literature. This sounded like a good answer at the time. However, I am beginning to see that if this research is to have impact on the practice of designers, instructors, and counselors, I must develop these themes into both a framework and a model.

The chief purpose of a model is to reduce the complexity of the components within a system so that the relationships between the components become apparent. For this reason, models are invaluable to the discovery and examination of relational (operational) principles within a system.

A framework, in contrast to a model, makes components within a system clear and distinct from one another, reducing the importance of relationships between components. Thus, frameworks are helpful for scaffolding complex experiences, processes, and skills.

I need to write a paper after this study that describes an extensible model of themes related to learning failure experiences that can guide future research about these experiences. I also need to write an article that describes a framework of components related to learning failure experiences that can scaffold work with struggling students.

This model and framework will be related, but will answer different questions about learning failure. The knowledge generated by the exploration of these questions will be critical to the improvement of our understanding about student learning.

Data collection and management | 12 Dec 2013 (1:08pm)

I have spent a good deal of time trying to collect and manage the data for this project. I never appreciated how important that was until I got near the end of this project. I was using MS Word to code my case transcripts by using the commenting feature. Then I had to go back and make

sure my codes were consistent within the case. Then I had to figure out the VBA code to use a macro to export the codes, the comments, and the related case quotes. Then I went back an organized them by case. This was a lot of extra work because I wasn't as well organized with my data as I would have liked. I credit the Robert Stake case analysis worksheets for helping me see the need for this high level of organization. I now have Worksheet 3 (individual case analysis) complete and organized for each case and am ready to go on to Worksheet 4 (cross-case analysis). I anticipate that I will need to go back and forth between these worksheets as I identify cross-case themes.

This is a much more involved study than I had anticipated, but I am glad I have the experience doing it now because I will be much better prepared when I conduct qualitative studies in the future. I will send my revised Worksheet 3 set with the theme and quote sets to my professors for review.

I am most impressed with the idea that the students in this study seem determined to succeed, even when they are failing. They continue to persist until they reach a point where they decide the effort is not worth the payoff anymore. They then either seek help with their learning failure or they change their learning goals (possibly to mitigate the negative feelings associated with the learning failure). While I am anxious to conclude this study, I have so many more questions now about learning failure experiences. I suppose I will have plenty of opportunity ahead of me to pursue these questions. For now, my next step is Worksheet 4 - cross-case analysis...

Major themes from the study | 23 Oct 2013 (9:46pm)

Two of the major themes I am seeing in this study are how future-oriented higher education is and how our past experiences drive the development of our preferences and attitudes towards learning. These are not new concepts, but this is the first time that I am seeing the development of our selves over time. We have experiences that shape our attitudes and predispositions towards learning that can either push us through learning failures or create them artificially for us. When we develop the idea that we are incapable or not interested in a concept or skill, we prematurely cut ourselves off from additional experiences with them. We have great potential that is bounded by our attitudes and our experiences. Somehow we need to help students better navigate their learning failure experiences so that they don’t prematurely cut themselves off from wonderful experiences and growth opportunities.

I suppose that this also raises the question of whether we ought to specialize or generalize in our knowledge and skills. Surely the dispositions of the student drive their development. I wonder what leads a person to specialize or generalize?

Analysis and the instability of causal attributions | 25 Sep 2013 (10:07pm)

I am realizing that there is so much to every case in this study that I am going to have to limit the depth of my analysis of the cases to just the most meaningful insights. I see so much value in Stake's recommendation of multiple readings. I read through the ASL case for Jason once and used Stake's worksheet 3 to document some of my understanding. Then I went through a little slower and began to highlight and annotate the case in Microsoft Word. There are so many questions I am curious to ask and so much that is flooding out of that case.

One of the stunning realizations I had was about attribution theory. Both Weiner and Dweck use the quadrated framework for diagnosing a student's causal attributions for learning failure. Dweck implies in her book, "Mindset: The New Psychology of Success" that these attributions are unstable and can be modified. What I realized during my analysis tasks is that if the

attributions are unstable, then they are a poor foundation for learning interventions, unless the intervention evolves along with the attributions. Dweck's point is to coach individuals to develop attributions that reinforce effort and internal locus of control. In this way, the individual takes responsibility for the results of their learning experiences and can work through them. However, causal attributions are just one affective part of the learning experience. With learning failures, multiple issues need to be diagnosed and addressed by an intervention - not just the attributions for the failure. And because human learning is dynamic and emergent, learning interventions need to simultaneously address these multiple issues.
These are important ideas to understand if the quality and effectiveness of our learning interventions are to be improved. The better we understand the issues related to learning failures, especially from the student's perspective, the better our intervention designs can become.

Amy's edits | 21 Sep 2013 (4:20pm)

I heard back from Amy about her case narratives. Here was her response:

Hi Keith!

So I've read through all of the documents, and they all seem okay. I made small corrections here and there in the documents that were just changing a word from "when" to "win" and things like that; things that didn't matter much to the context. Every so often I added in a few words in parenthesis to help explain a situation a little bit better, but not much. Whenever there were bigger changes, I just crossed something out and then added comments or input and highlighted it. But that really didn't happen often.

What I was struck by the most was how horrible my grammar is in my regular speech! There were plenty of times when I feel like I sounded very light-headed or silly, but oh well! You know what I meant because you were there talking with me, right? I don't know who else will be reading these transcripts, but if you ever quote from them, are you going to fix the grammar? ;) Because I wouldn't mind that. Haha! Oh yes, and there were a few times when I switched back and forth from talking about a class the first time I took it, versus a later time I took it, and I didn't do much fixing but I hope that you can tell when that is...

Anyway, I think they're okay. It's been a long time since we last spoke, but I wanted to let you know that my life is going well! After I finally graduated last June, my husband and I moved to Atlanta where he has been going to grad school at Georgia Tech studying aerospace engineering. We are also expecting our first baby in November! (If you didn't already know- I feel like my dad liked to tell everyone about it in the beginning!!) So my plans for grad school are put off for the time being. But whenever I feel ready, or whenever we feel the need, I think there will be a lot of good opportunities for part-time work in public health around here as well. But only after I've had my chance to really enjoy being a stay-at-home mom! :)

Thanks for allowing me to participate in your study! It was really good for me as well to be able to talk about my schooling in the setting that we did- it helped me better understand the way I learn and think about myself, and I hope it will one day help my ability to understand the way my children learn and think about themselves too!

I hope you and your family are all doing well! Have a great day!

Amy

PS, I've attached my edited documents to this email.

Here was my reply:

Amy,

Congratulations on the new addition to the family (in the near future...)! That is so exciting. I can remember when our first son was born and how incredible the experience was. I know that you will really enjoy being a mother.

I also enjoyed going through your edits and thoughts regarding your stories. As for the grammar, no one is ever polished in transcripts because we speak different that we write. But I get that a lot when I show people their words from interviews. As for correcting grammar, I would only do it if the ideas needed clarifying. Mainly, I want people to hear your stories in your own words - to get your perspective on your experiences. Too often the researcher will put everything into their own words and try to make sense of things. But I am interested in how you made sense of your experiences.

I am still learning from your experiences you shared with me. I will continue to analyze them for themes and trends as I write up the report on the study. I would like to send you what I come up with so you can see what I see in your experiences. Would you be willing to review what I send you in the future? I know you will be dealing with "mommyhood" so I want to be sensitive to your time and needs. Let me know what you would be able to do. And thanks again for being willing to share your stories with me.

Sincerely,

Keith Proctor
Brigham Young University

I read through the edits and comments she made and they were pretty minor (really they were corrections I should have caught in the proofreading). She added a sentence or two to the bottom of some of the narratives to provide additional context or to clarify a point in the narrative. I plan on incorporating her changes into the final documents and beginning the analysis phase. This is getting exciting!

The power of the student perspective | 16 Sep 2013 (5:33pm)

I have been reflecting a lot on the value of this study since that will be a key emphasis in the report. I have noticed several additional tie-ins to my research in different journal articles I've read that were not apparent when I wrote the proposal. My first thought was that I had been

beaten to the punch and that my research had been replicated by these other researchers. But as I examined the articles, I realized that none of them used the same method I am - addressing student perspectives by telling their story in their own words. While some of the studies use methods similar to a case study approach, the analysis typically turned out to be more "quasi-qualitative-mostly-quantitative." The reported findings included word/phrase frequencies and a smattering of direct quotes to strengthen or adapt a framework-based argument. The most common of these frameworks is the one developed by Weiner related to Attribution theory. It traditionally has contained four quadrants that juxtapose high and low effort against internal and external locus of control. Most of the studies related to learning failure have sought to enhance this basic matrix or to use it as a paradigm for explaining student reactions to learning failure.

I also realize that my question has been fundamentally different that those of other researchers on the topic of learning failure. I am asking what the experience is like from the student's point of view. The other studies I have read are mostly interested in what category of failure can a student's experience be placed. The rationale typically goes something like: if we can identify the type of failure (using Weiner's attribution matrix most frequently) that a student experiences, then we can apply the "antidote" learning intervention to correct the failure. Most of these studies follow with a call for more research into the efficacy of specific learning interventions and strategies related to the findings of the particular study. But I feel like this is fundamentally flawed.

If a student experiences a learning failure, they, the student must first come to terms with the failure. They must gain an understanding, themselves, of what went wrong and what they will do about it. Learning interventions have a definite role in helping students overcome their learning failures, but not before the student is able to make sense of the failure, themselves, and place the intervention within their own intentional plan for resolving the failure. In other words, a learning intervention must be adopted, understood, and executed by the student - instructors cannot learn for the student. So it follows that students first need to understand their learning failures before an intervention can truly have any effect on the learning. It could be said that this process of coming to understand the failure can be a part of the intervention - and I would agree. However, this facet of learning interventions has been completely absent from the literature with which I am familiar.

This thesis study seeks to understand how students understand their learning failures, albeit in retrospect (which I believe is the only way to cognitively understand them). From these findings, we may be able to find better ways to assist students in the evaluation of their learning failures and increase the effectiveness of learning interventions. So, I suppose a larger goal of mine is to improve learning failure interventions in a way that leads to faster and more effective learning failure resolution on the part of the student.

Jason Member check on cases | 16 Sep 2013 (5:12pm)

I heard back from Jason today on his compiled cases:

Hey Keith,
I just read through everything and it looks pretty good. I had a hard time following the Learning Failure Defined document but there isn't really anything incorrect about it. Good ahead and use them. I just think I had a hard time with English that day.

- Jason

I had originally sent him the following message:

Hi Jason,

I know it's been a while since we last talked. I hope your new semester is going well! I have been working through our interviews and have pulled your quotes together into a series of cases that I have attached to this message. I have left the stories in your own words (with some minor grammatical adjustments).

I need to make sure that I have honestly and accurately depicted your experiences. So, please take some time in the next two weeks to read through the stories and give me any feedback about inaccuracies or things I missed.

I need these back by September 20 so I can write the report on them, so if you could respond by then that would be great. If the timeline is going to be a problem, just let me know and we'll figure something out.

Sincerely,

Keith Proctor
Brigham Young University

I echo his thoughts on the "Learning Failure Defined" case. I expressed to Dr. Yanchar that I would probably have to summarize those cases along with the "Backstory" cases because of their length. My hope is that I can still preserve the context and backdrop of the remaining cases. I think I can pull it off. I will begin Stake's recommended process of analysis for multicase studies on Jason' cases while I await a response from Amy. I am excited for this phase of the study because I feel I have a better grasp on analysis and it is less labor-intensive than the transcription and case compilation was.

Final Case Narratives | 4 Sep 2013 (9:46pm)

I have finished creating coherent, readable case narratives for each participant in their own words (without narration). In doing so I realized that I have far more material than I can feasibly include in this study so I will have to go through and find ways to summarize the important, long cases and decide to drop certain of the weak, shorter cases. This will have to be done with care so as to avoid overlooking significant themes. Perhaps there is a way in a separate article to address some of the deeper meanings of these experiences with a different analysis and different questions. I am grateful now that I was prompted to do all of this hard work because I have transcripts and narratives that are incredibly rich in terms of their themes and stories. If they had no other value than to tell the story of struggling college students, I would think that the work has been worth it. However, I believe the insights gained through a careful analysis of the complex themes inherent in these episodes will serve to clarify future research pathways and

better intervention designs. I hope to extend and pursue some of these goals in my next PhD project and dissertation project.
I am also grateful that my committee has allowed me the time to work thoroughly through this without rushing me. I believe that it would have been easy to rush through this study and minimize the outcomes. But then the study wouldn't make the kind of contribution to the literature and practice of the field that should be required of a thesis.
So I am excited to see where this goes from here - on to analysis!
Student diagnosis of their learning failures | 17 Aug 2013 (12:18pm)
As I polish the case narratives further, I realize that what I got from the students in the interviews was their attempt to analyze their learning failure experiences. They looked for causes and attitudes that caused their learning failures. But as time progressed and we talked more about the experiences, they gained new insights about themselves. Often, what the students initially thought caused the learning failure changed and led the students to new insights about themselves, their motives, and their learning capacity. This is some of what Carol Dweck describes in her book "Mindshift." Attitudes and perceptions can change, which then lead to improved self-concept.
In my studies over the past few years, I have noticed that the students who are able to more thoroughly evaluate or diagnose their learning failures are the ones who typically work through the failure with success. This process of diagnosis includes reflection on their attitudes, their motives, their past experiences, etc. Some students are better at this than others - perhaps because they have had more experience with it. This is a critical learning skill. I would like to research this more in the future.

Emergent nature of learning failure | 17 Aug 2013 (11:44am)

I have finished compiling the case narratives and now I need to polish them and improve their readability. I have learned a lot going through this process. I have noticed most of all the emergent nature of the learning failure experiences. By emergent, I mean that that the learning failures were not deliberate or intentional. I believe that a big part of the complexity of these experiences is a result of their emergent nature, meaning that the experiences are largely unpredictable. Students do not begin pursuing a learning goal with the intent to fail, so learning failure is an experience that is difficult to plan for. For these reasons, it is also impossible to prevent learning failure 100% of the time. The best that students can do when learning failures occur is to evaluate the failure and figure out a way to move forward. Attribution theory can be helpful when diagnosing learning failures, but it is only part of the diagnosis. It deals primarily with the affective aspects of the experience. The work by Meyer and Land on Threshold Concepts and Troublesome knowledge address the cognitive aspects of the failure experience. Lave and Wenger's work on Communities of Practice addresses the social aspects of the learning failure. So, I believe that we need a way to bring these ideas together into a holistic framework for understanding and diagnosing learning failure experiences. Hopefully this will lead to more holistic and effective interventions. While such a framework is a bit beyond the scope of this study, I believe it would serve me well in my dissertation.

Compiling case narratives | 1 Aug 2013 (9:56pm)

I am finding that compiling these cases is a ton of work too, but it is going faster than transcribing because I don't have to wait for the audio file or have an active internet connection all the time. But I am finding it difficult to write a coherent narrative from the participant statements and choosing what not to include. I am also finding parts of the transcription that were not done very well, so I am pseudo-correcting some of the misspelled words also.
I am learning a lot about these participants in this process. I see how they genuinely want to succeed in their studies and they have real hopes and goals they are working towards. It would be impossible to reduce their motives for going to college to a single statement or to simple outcomes. They are constantly learning about themselves throughout the interviews, changing their minds, and reformulating their understanding of their learning failures. On the one hand, this makes it difficult to talk about learning failures in a linear way. The experiences appear to be emergent and evolve through our dialoguing. On the other hand, this is a fascinating finding because it points to the capacity for people to change their understanding of failure experiences and to work through them.
So, to tell their story effectively, I am going to have to narrate occasionally to provide context. Dr. Yanchar and I discussed this briefly in our recent meeting, so I feel good about taking a shot at these narratives. I intend to send the narratives out to the participants for review as soon as possible. I want to get their feedback on how their experiences are being portrayed. Then I want to conduct the analyses of the cases and generate the themes and findings for them to review. Provided all goes well, I will have a trustworthy study that I can report on by September/October. There is a lot of work between now and then, but I feel the pieces coming together...

Compiling cases | 27 Jul 2013 (8:42pm)

I have been working to review transcripts for the learning failure study and parse out information that I can put into cases. In the interviews, the students naturally tended to categorize the learning failure experiences by subjects. So I went through and coded every interview by subjects and then pulled the quotes together into word documents to assemble into cases. That was a long process, but fascinating as I began to see clear themes emerge. I am learning that the way I code the interviews and the questions I ask of the data drive what I find. That's not to say we only see what we are looking for, but it does suggest that the richness of the data cannot be completely appreciated within a single study. There will be more questions to ask of the data after this study is concluded.
I was able to compile four cases so far. I am noticing that there are holes in the narratives, but the missing details do not prevent the development of themes in the cases. I am finding that there is a balance between detail and findings. There is a point at which the data collection process should stop and findings generated from the data. The purpose of the study is not just to generate data, but to provide insight into learning failure. So, I am satisfied with the amount of data I have collected and anticipate developing some significant findings during the analysis of the cases.

Transcription formatting and final touches | 6 Jul 2013 (8:39am)

I have now finished the transcription process with all of its meticulous details and formatting. These transcripts are precious to me and represent an inordinate amount of work. As I now contemplate writing the case narratives I find myself having to switch gears and think more

analytically about the interviews. Several powerful themes have come out in the discussions I had with Amy and Jason. Both of them had completely unique experiences and yet there was so much overlap. I believe the wisdom in keeping their cases separate from one another and treating them as individuals was genius. We cannot generalize from Amy's experiences to understand Jason' experiences, but we can look across Amy's experiences and get a better idea of how they play off one another. Experiences tend to build off one another, constantly refining and challenging our understanding. Jason' experiences are unique to him. He could read about Amy's experiences and analogously understand something about himself, but he would have to be the one to make that connection, that transfer of ideas. The purpose of this study was to look across the learning failure experiences of an individual and appreciate their complexities and fine points. Rather than operationalizing failure to a set of behaviors and causal mechanisms, I wanted to see the human experience for what it was to the individual and how they went through it. These questions asked by this study yield more questions to pursue in future research studies. For example:

- How do peer influences and experiences shape our self-conception and the understanding of our abilities?
- What drives us to do hard things?
- How can we best understand our learning failures, especially when they seem so contrary to our expectations for success?
- What can I learn from the learning failures of another?
- How does my understanding of my learning failures evolve through dialog about them?
- How do different people define learning failure? What causes the differences in definition?
- What can learning failure reveal about myself?
- How can I best understand my learning failures?
- What determines how good at something I think I am?

I have so many questions from this study and so many interesting insights. In reporting these findings, I hope to demonstrate the complex nature of these experiences and to emphasize the need students have of understanding these experiences for themselves. Additionally, I hope to encourage educators to dig deeper with their students to help them understand their learning failures. Grades are a good initial indicator of performance on an assignment or exam, but they are not sufficient to help us gain deep understanding of student capacity or potential. We need students who are more self-aware and educators who know how to more deeply assess and evaluate student experience. This study will not address how to best accomplish these goals, but will highlight there importance. In future evaluations and design-based research projects, I hope to approach solutions to these challenges.

The importance of peer influence and role models | 13 Jun 2013 (8:59pm)

As I come to the end of my last transcript for Amy, her thoughts about the influence of her friends on her decision to enter the health care field have been fascinating. For a while now I have had the thought that in the absence of future goals we often look to trusted and perceptibly successful individuals in our life for clues as to what our future could be. In other words, we model our lives, in part, from the goals and experiences of those closest to us. In this case, Amy's peers led her to become interested in the field of nursing, which she later discovered was not interesting to her. Actually, the health care field was interesting to her, but the duties and responsibilities of nursing were not. So her peers were responsible for forming her perceptions of

what she thought she wanted to do and her experiences in college led those perceptions to evolve. Her concrete experience with nursing and her learning failures in college led her to explore other related fields. Eventually she identified with the Health Promotion/Education field. The path to a degree, even in the appealing health promotion field, was still difficult.
I am finding it extremely interesting that the example of Amy's mother's life was a critical part of her motivation for going to college and earning her degree. Actually, her mother's life represented a negative example for Amy. In other words, Amy perceived limitations to her mother's life that resulted from not having a college degree and this motivated Amy to attain one. So, this motivation helped Amy continue persisting through her learning failures to eventually attain her college degree.
The conclusions I draw from all of this is that the people we associate with significantly influence our motivations, our self-conceptions, our life goals, our levels of persistence in the face of learning failure, etc. These influences cannot be understated and their presence in my work with Jason is also extremely apparent.
There are also strong evidences in these transcripts to suggest the influence of peer and family models on troublesome knowledge and threshold concepts (Meyer and Land), although I have not seen that connection made in the literature yet. I will have to explore that further in future studies.

Member checking | 4 Jun 2013 (10:51am)

I emailed the transcripts I have completed to both the participants about two weeks ago and asked them to look over them and give me any impressions or feedback. Neither have responded, so I think I am going to have to follow up with them. But as I work to finish up the transcription process, I notice that I did quite a bit of member checking in the interviews by asking questions about thoughts and impressions I had. Ultimately, the stamp of approval from the participants on the final report would be the best form of triangulation, I am left wondering if I am going to get that. I will continue to contact them and give them updates. I may even try to meet with them in the next few weeks to do live member checking of the themes and trends I notice in their cases. The whole project has been really interesting and I am still learning so much, especially in these final interviews where we discuss and summarize the ideas we have discussed during the study. I am confident that the information generated from the cases in this study will shed significant light on our understanding of learning failure experiences and students' perceptions of their failures.

Inference and Learning | 9 May 2013 (9:00am)

After going to bed last night I was thinking a lot about the transcript I had just finished and was thinking through the themes and patterns I had seen in this research study. This morning when I awoke my mind was fixed on the concept of inference and its role in the learning failure experiences I have been documenting with my students. I jotted several ideas and implications of these ideas down in a notebook and felt I should reproduce them in their raw, un-filtered form:

- Learning failure is fundamentally a problem with inference. Students do not correctly infer the cause of their learning failure, which leads them to develop erroneous perceptions and attributions.

- Inference is a judgment activity in which a student takes limited information (i.e. feedback) and determines meaning and implication about something else
    - Example: A student receives a D grade on a quiz that they studied hard for (limited information). The student then infers that the poor grade is due to a lack of ability to understand the concepts (attribution, meaning, implication). In other words, the student takes the poor grade to mean or imply that they are "not good at" that particular subject (which may or may not be the case, depending on additional information not apparent to the student).
- Inference is natural for human beings given the limited nature of feedback and information by which we make decisions.
- The way to increase our capacity for inference is to increase the information available to ourselves. In a learning failure, the best way to help the student is to increase the amount of information about the failure to better inform the student's inferences about the meaning and implications of the failure.
- Learning is inference. We learn by making inferences regarding the information available to us from our experiences.
- Learning failure can thus be described as incorrect inference about information.
- The fundamental problem with learning from inference is that our information/evidence is always incomplete, so our inferences are always potentially flawed
- The only way to save this situation of flawed inference-based learning is to assume that there exists a perspective from which all things can be understood harmoniously - at the point when all information is possessed by the individual.
- Inference-based learning is bi-directional, in that it deals with new encounters with information as well as with the re-evaluation of previous information.
- Logical deduction is only theoretical and is wholly confined to the scope in which it is considered.
- Human experience is completely inferential, based on a foundation of limited information.
- Describing learning in terms of instruction (i.e. behaviorism, cognitive science, constructivism, etc.) is only profitable to the extent that these descriptions address or promote better inference-making on the part of the student.
- Inference is a key construct of learning.

This idea of inference in learning has been as critical an epiphany as the idea to explore learning failure. It only makes sense that in exploring learning that I would learn something about learning itself. I understand so little and feel like I am at the edge of a vast ocean of exploration and that those research vessels upon the waves are few and far between.

Another transcript done | 8 May 2013 (9:43pm)

I just finished another transcription. It was long, but extremely insightful. I have a lot to think about. I think that there is a lot of value in one-on-one instruction, which is obvious, but I believe it's because as students, we need the opportunity to dialogued with someone more knowledgeable than ourselves to be able to identify the flaws in our thinking and our deficiencies in communicating our ideas. Without the opportunity to dialogued, the only opportunity we get for feedback is the grades on the tests, which tends to be more summative feedback than formative. Feedback is critical and quality of feedback has a direct impact on the learning failure experiences of students in that they cannot effectively identify or work through their learning

failures without the feedback from a more knowledgeable other (to use Vygotsky's term). The feedback helps the student to evolve their own capacity for evaluation of their experience, which in turn leads to improved self-regulation and self-learning skills. In the absence of formative feedback from a more knowledgeable other, the student is left on their own to guess at what they do or do not correctly understand. And the sad fact is that neither teachers nor TA's can give each student of every class the feedback and attention they need to effectively develop this evaluation capacity. Something of an intervention needs to be developed to help students evaluate their learning experiences the way that a teacher sharing a one-on-one feedback experience would do. That may sound presumptuous, but I intend to continue exploring these learning failure experiences so that I can design and develop just such an intervention. I don't know what it will be or look like yet because I still don't understand the phenomena well enough yet. But I am beginning to get some powerful insights about learning failure that will help me.

More ideas on learning failure | 20 Apr 2013 (11:07pm)

Aside from finishing two more transcriptions (2 1/2 to go!) I met with another student at the request of his mother about his struggles in his classes at BYU. The interview was totally different than the ones that I have been working with. I did not record the interview or have the student complete a study consent form. I just wanted to talk and see what would be different about this student's experiences.

He immediately began to state his attributions for his struggles - medical, social, capacity, time management. But as we talked I also noticed that he had no clue as to why he was struggling. He expected to succeed in his classes because he had experienced success in similar classes in the past. He expected to be able to understand the concepts, but had no idea why he struggled with them. This was a large source of frustration that was complicated by the anticipated implications poor grades would have on his future at the university. If only he had been able to articulate his lack of understanding, he probably could have gotten help.

But that is where the conversation got interesting and it sounded similar to what I had heard from my other two participants. This student did try to ask for help, but was accused of not doing the reading assignment and his question was never addressed. After this negative experience, he didn't ask any more questions, but instead chose to struggle on his own to understand the concepts. This did not work, he fell behind, and is now in danger of failing the class. He also talked about feeling inferior in large classes and not wanting to expose his ignorance by asking questions. The smaller classes were easier for him in terms of asking questions, working with peers, etc. But he still was unable to get sufficient attention to explore his questions and misunderstandings. So, at this point, he is probably going to either barely pass his classes or he is going to fail them. This isn't a matter of capacity, it's a matter of personalized feedback and attention. It is a matter of being able to effectively evaluate his learning failures in the classes. Because he has struggled to figure out what he is not understanding, he is unable to work through the learning failures. At this point, the decision to work through the learning failures - to actually master the concepts, or to walk away rests on whether he has made a strong enough connection between what he is covering in his classes and what he wants to do after graduation (this is a major theme with the other two participants in this study).

I advised the student to continue working with the University Advisement Center professionals and to get clear on what it is he wants to do after graduation. I also discussed with him the fact that his is not an issue of capacity - he is completely capable of succeeding in his classes. I

advised him to be more aggressive in getting help when he doesn't understand the concepts in class and to talk with the professor and TA's early in a class that he is worried about. So, I hope he does well. If not, I hope that we, as a university, will learn from his experiences and improve the way we approach learning and student support. That is a central purpose for my study.

Themes and issues | 9 Apr 2013 (9:23pm)

I have been transcribing and it feels like it will never end. But I have been learning a lot. There have been two major themes that have come out of the interviews so far. The first is that students have a future concept of what they will do after finishing their studies. I would call this a 'desirable future state'. From the interviews, I am learning that if a student is not making connections between what is learned in class and the activities of the desired future state, they have a difficult time understanding the content. I know that this disconnect has been related to motivation, but I am not aware of it having been explored in conjunction with troublesome knowledge and threshold concepts. This is a really exciting theme.
The second major theme is the lack of evaluation capacity the students have with regards to their learning failure experiences. In other words, they may struggle with their learning failures principally because they are unable to determine what the difficulty is and how to go about resolving it. This has been a fascinating theme to explore with students because our interviews have led them to understand their failures better. As the students have understood their failures better, they change the way they think about the experiences and about themselves. Carol Dweck's work on Mindsets and changing our causal attributions plays in here. The key is to explore how the attributions change - what is the process? Can we encourage and facilitate the change in mindset? Is there more than a change in mindset to resolve our learning failures? These are interesting questions coming out at me now.
I have about 176 minutes of transcription left, so it will likely take me around 20 hours to complete. I want to have the transcripts done by the end of the month and the analysis done by May 10. I think I should be able to do this. I am working solid to get these transcriptions done so I can begin member checking and deeper analysis.
I also discussed with Dr. Yanchar my intent to develop the cases into emic narratives from the students' perspectives. This approach would then lend itself to the multicase analysis of the narratives and lead nicely to the answering of my research question. My question for this study related to what the additional themes and issues of learning failures are beyond attributions for the failure and fear of failure. I am learning a lot about this and am excited to share soon.

What is learning failure? | 4 Feb 2013 (7:41am)

I enjoyed great interviews with Amy and Jason on Friday. The key question in the interview was "how would you define learning failure?." It was a fascinating insight into these two, very different students. Amy described learning failure as the stopping or the cessation of learning. A person experienced learning failure inasmuch as he/she failed to continue to learn - something impeded the learning process. Amy also spoke to the potential for moving through the learning failure by considering different angles of whatever was stopping the learning. Maybe it was a difficult concept or maybe the concept wasn't explained well, etc. Jason defined learning failure in terms of failure to learn something. He discussed how a learning failure did not include learning something and then forgetting it, because what had been previously learned could be

remembered or brought to the surface again. He talked about his experiences with learning failures in an ASL class, where he learned the signs, but not the grammar. Grammar was covered in the class, but for some reason he did not feel that he was able to learn it. So, even though he got a good grade in the class from the teacher, he felt like he had experienced learning failure because he had expected to learn grammar in the ASL class that would enable him to communicate with the deaf. The interview got even more interesting as I asked him about his interest in ASL. He told me of an experience he had with a young deaf man on his mission and how difficult it was to communicate with the young man everything that Jason wanted to communicate. The experience led Jason to want to learn ASL, return to Micronesia, and speak with this young man in sign language. This was a fascinating revelation!

I have thought a lot about this interview and how something of a learning failure in the past drove Jason to want to learn something he previously had not thought much about. In fact, it was Jason view of future events that inspired him to want to take the ASL class and it was this future projection of wanting to speak with the young man from Micronesia that led him to evaluate his ASL learning experience as a partial failure. As I talked to Amy about her original desires to go into Nursing and to serve as a PA, she explained how in high school, a lot of her friends wanted to go into nursing and so she felt she could see herself doing the same. As she began to take classes at BYU, she decided that she did not really want to be a nurse, but she enjoyed the health field and so decided to become a health educator. What changed was not only her views of her capacity to become a nurse, but also her views of what she could see herself doing as a nurse. Additionally, Amy spoke of her aspirations to be a college graduate because of watching her mother. Her mother is not a college graduate, but is successful and happy in Amy's opinion. However, Amy explained that she thinks her mother could have done a lot more in her life if she had a college degree. Amy then explained how her drive to get a college degree is so that as a mother, she could do more than she perceived her mother was able to do. All of this took me back to the agency in education class where we discussed Joseph Rychlak's concept of telic perspective and meaning.

Rychlak's idea is that human beings are telic, in that they project onto themselves future possibilities and then act in a meaningful, agentic way to accomplish those telic projections. Along the way those projections can change, but they still drive human behavior. I have seen this in this study of learning failure. Those telic projections made by students drive them to pursue meaningful learning experiences that they perceive will lead them to the actualization of their telic projections. Students will be deterred by learning failures to the degree that their telic projections change because of the failure. In other words, if a student who is interested in becoming a nurse has a difficult time with a science class, as long as the student's telic projections of becoming a nurse and engaging in nursing activities does not shift, he/she will most likely do what it takes to push through the course and learn what needs to be learned. If, on the other hand, the learning failure in the science class leads the student to question his/her telic projections of nursing activity and their desirability, the student will probably change their telic projections and decide that the science class is no longer relevant to his/her new telic projections. As I think about this, I would like to ask every student in a given class three questions that will help me determine their level of motivation to pass the class:

1. What profession are you preparing for in your life right now?
2. What are the top three things that you see yourself doing as a member of your desired profession?
3. How do you expect this class to prepare you to do those activities you have mentioned?

The degree of description in these questions would tell me a lot about a student's telic projections and how likely they might be to do what it takes to pass my class. The degree of difficulty in the class would be negligible because the mediating factor would be the student's perception of how likely the class experience would be to prepare him/her for the projected profession and professional activities. As human beings, we have enormous capacity for achieving our telic projections. This capacity, I believe, is at the heart of agentic learning. Understanding more about learning failure is leading me to understand a lot more about agentic learning and teaching.

Howard, G. S. (1987). Toward a Telic Vision of Human Beings: A Dialogue with Joseph F. Rychlak. *Journal of Counseling & Development* 66(1) 12-19.

Empathy | 30 Jan 2013 (1:54pm)

I am excited to get two more interviews with my participants this week. And as I anticipate our upcoming meetings, I have been thinking about a question that has undergirded this study that I have never explicitly asked - what is it like to be them? When all is said and done in this study, the greatest product will be a description of student definitions of their experience with learning failure. But I wonder whether we are really able to understand what it is like to be them, or if we have to content ourselves with understanding only on an analogous level - through empathy. Empathy is perhaps the deepest level we can ever understand another human being without actually being that other person. I know this concern is at the heart of the hermeneutic and phenomenological movements. So in preparing to analyze the interviews, discern themes, and write a report of what I have learned, I am contemplating this most profound theme of empathy. I have all sorts of questions about it :
Do our learning failures impact our capacity for empathy? If so, in what ways? How does it impact our capacity for empathy?
Does the context of the learning failure affect its impact on us and our capacity for empathy?
Does learning failure affect us outside the realm of our educational endeavors? How? In what ways?
This study is just the tip of the iceberg. I believe that the ideas of threshold concepts and troublesome knowledge (Land and Meyer) are critical components, but there is so much more to these experiences that has not been explored (at least not that I am aware of). In my mind, understanding learning failures is at the heart of generating productive learning experience. For me, this research is like taking a one man dog sled expedition to the North Pole with no clear signs or outposts. My committee has been great in guiding me this far and their critique of this study will be invaluable. But in the future, I will have to walk beyond my committee and find others in our field (and outside) who can guide me in exploring these experiences.
I m hesitant to say too much about the themes I am seeing in the study as yet because I still need to review the transcripts multiple times and I need to check my findings with the student participants. But I feel like I have begun to understand so much already from the transcription process and the interviews.

Power of storytelling | 16 Jan 2013 (9:58am)

The transcription continues apace... I have been reading the book "Leadership and Self-Deception" and while its content is great, the first-person narrative is brilliant. This research

study I am conducting is going to produce themes and issues of learning failure experiences that go beyond mere attribution and fear (the predominant themes in the current literature). In order to communicate these themes and issues, I have chosen to use first-person case studies. Part of the power in these case-studies is that the reader can identify with the experiences of the students I am interviewing. That personal connection can help to make my argument that we really shouldn't reduce learning failure experiences to a set of attributions or emotions. We need to grapple with their complexity and seek deeper understanding - both us as researchers and the students themselves. This deeper look at these experiences will reveal more to address than changing the way we think about failure or overcoming our emotional responses to it. This deeper look will hopefully lead us to more holistic approaches to learning failure experiences that are beneficial for students, teachers, and researchers alike. Understanding and complexity are dialectical concepts that hold one another in balance. We must have both.

Transcription | 26 Dec 2012 (9:59pm)

I just finished my first full transcription. I have been experimenting with using Dragon Naturally Speaking and raw typing to get the job done. I almost think it was faster to hand type. But maybe not. I have to keep going with the experiment. After finishing this transcription, I really feel like I made the right choice in opting to have both Jason and Amy as final participants. Jason' first interview was so chock-full of good insight. Even though he seemed to be searching for answers to my questions, his responses were coherent, thoughtful, and engaging. It was helpful to do the transcriptions myself to better familiarize myself with the interviews again. I am excited to conduct the cross-case analysis on these transcripts once I get them all done. I have 5 more interviews to transcribe and probably at least four more to conduct. So I am going to be busy with this project this semester. We'll see how quickly I can get through the transcriptions...

Going back to the beginning | 21 Dec 2012 (9:36am)

As I go through the transcription process for the interviews in this study, I am amazed at how several of the emergent themes are identifiable in the very beginning of study. In the first interview with Jason he was describing the disconnect between what he is doing in class and his perception of the career work he wanted to pursue. He was also describing the evolution of his interests, like a narrowing of focus. He developed criteria for career and course selection through his experiences. His end goal did not so much change as it refined with experience. Hi pathway changed, but the end goal was relatively stable. I have seen the same themes in my interviews with Amy. At this point, my intention will be to create two narrative case descriptions much like Studs Terkel in his book "Working." From there, I will be able to reference the cases in describing the themes and issues of learning failure experiences. As I continue to think through the findings of this study, I find them to be pretty commonplace - practitioners and researchers alike understand them and talk about them, yet no empirical evidence for them existed in the literature reviews I conducted. It is important to remember that the focus of this study is learning failure experiences among college students. I think the assumption is that research on K-12 populations automatically transfers, but no one knew when I was reviewing articles and studies about it. The methods are different for this study as well. My assumption has been that college students are more articulate than K-12 students would be. College students in this study have also proven to be more reflective about their experiences than the K-12 students in other studies I

reviewed. This makes for a richer, more emic case than I have come across yet. The emic nature of these cases and the etic analysis also form a compare/contrast triangulation of the themes that is typically not possible with strictly etic studies - studies in which researchers frame observations in terms of their own lenses and perspectives. Without a good student perspective on learning failure, how can we know we really understand? At this point, Roger Schank's ideas about degrees of understanding becomes critically important. We need to make sure that we sufficiently understand students' learning failure experiences before we can connect with them and assist them. This study is all about understanding for connection with the student. I feel a bit like an anthropologist, part psychologist, part mentor, part friend, part confidant, etc. I have a deepened appreciation for teachers that connect with their students and change their lives.

Great Feynman Quote and Implications | 10 Dec 2012 (11:01am)

“It doesn’t matter how beautiful your theory is, it doesn’t matter how smart you are. If it doesn’t agree with experiment, it’s wrong." - Richard Feynman

This left me thinking about the outcomes of this study. Considering what questions might be asked about the findings and their relevance to education. Here are some of the questions:

- Now that we see what themes and issues are experienced by college students during learning failures, are they generalizable? In other words, what does this mean for the rest of the college students out there who are going through learning failures?
- Other college students have experienced different issues and themes than those of students in this study, so what do we make of all this? What is the point of studying the issues and themes of an individual college student? What does it buy us?
- What do we do next, now that we have this new insight into the learning failures of a college student from BYU? What can we do next?
- Can learning failures be classified in some way? Should we classify them? Has this classification been attempted in the past? If so, what were the results?

Activity, Application, and Articulated Misconceptions | 5 Dec 2012 (10:46am)

Activity and application lead students to articulate their misconceptions. It's in the ***doing*** that we realize that there is something we don't understand (Schank). Simply reading books is not enough (although it is foundational and extremely helpful) for us to uncover all our misconceptions. When we begin to act we begin the process of articulating our misconceptions. Assessment in schools is one excellent way to articulate misconception. The problem with most testing is that it requires from teachers a degree of interpretation and understanding the test construction to identify clearly the misconception of the student. Additionally, most formal testing is summative - not formative. So there is no opportunity to correct the misconception following the testing experience. Students take tests and when they get the results, they may be able to self-correct their misconceptions - but not always. They may need help from an MKO. Learning consists of this experience of articulating and correcting misconceptions. Articulation may be verbal, it may be manifested in deficient action (failure), it may be cognitive (dissonance), etc. Articulation can take many forms.

Some misconceptions may not lend themselves to easy correction. At times the needed correction is painful and requires sacrifice on the part of the student. Sometimes the cost of correction exceeds the personal cost threshold of the student. In other words, to change may require too much of some people.

Articulated Misconceptions | 5 Dec 2012 (10:25am)

I had an insight about learning and productive failure (Kapur). There is value in getting a student to articulate a misconception. When a student articulates a misconception, sometimes they can see the error in their own logic and correct the misconception. If the student is unable to correct their own misconception, at least a teacher or mentor can then take the articulated misconception and help the student correct it. The problem lies in students not being very good at articulating their misconceptions. Because misconceptions often remain tacit, students struggle to understand what they don't understand. They are unable to understand what or why they don't understand. The learning goal always relates to understanding something (Schank's work on case-based explanation). Tacit misconceptions cannot be corrected by a teacher or mentor or more-knowledgable other (MKO - Vygotsky). Kapur's idea is to let students struggle to solve a problem before allowing the teacher to intervene. The reason this is effective is that the struggling process is really the articulation and clarification of the misconception. Once the student has articulated and clarified to the extent of their capacity, the MKO can then either help the student correct the misconception or continue to clarify it. In either case, the student is making explicit what he/she does not understand. This is often done through questions. In my learning failure study, I am working with student to clarify and articulate their learning failures. Every time I interview with a student, this is a clarifying experience and they garner insight into their failures that they never had before. In a sense, this is nothing more than clinical therapy for learning failure. Perhaps what I am after is understanding the intersection of clinical psychology and learning. Failure is a prime intersection because of the tacit and often cryptic nature of the failure. People don't understand what went wrong. My study is exploring the themes and issues specific to student learning goals/intent and failure, but clinical psychology might have been a good place to start. My impression of clinical psychology is that it focuses on identity (which is important) while leaving the individual to sort out the academic facets of learning failure. We need a psychologist and an academic counselor in one. Perhaps that is the ideal training for teachers these days.
In any case, articulating misconceptions is at the heart of learning. If we can ask a good question about what we don't understand (Schank) then we can find someone with an answer to our question. Maybe the internet and its distribution of content can facilitate the correction of our misconceptions. Maybe it just multiplies our misconceptions. That is a little beyond me right now...

Two big questions to answer | 4 Dec 2012 (8:32am)

As I have been reviewing and thinking of the interviews I have already completed, I find two big questions that still need to be answered:

1. How do students define and identify learning failure in their own experiences - from their own perspectives
2. When others identify learning failures in their lives (poor grades, instructor/peer comments, etc.) does the student agree with those evaluations? Why or why not?

These questions get at the heart of learning failure experiences. This study set out to document learning failures from the student perspective (since it has not been done before). The outcome of these documentations would be a better understanding of the range of themes and issues inherent in learning failure experiences - from the students' perspective. These outcomes are important

because they highlight the complexity of the experience and demand more rigorous understanding of context, personality, history, culture, etc. of students if they are to be helped through these experiences. So far, we have some very interesting experiences documented. There has been quite a bit of attribution for the failures, but not enough definition of learning failure or deep understanding of what they mean in the larger life context of the student. We are beginning to get there as we have discussed the goal-mediation effects of failures and successes in our last interviews. But we still need to explore the definition of learning failures. From what I have heard so far, I believe that learning failures are different for everyone. Most often, the student identifies their own learning failures. When another person identifies a failure for the student, the student then takes the opportunity to evaluate the evaluation of the person to see whether he/she agrees with it. The student always has the final evaluation. For this reason, poor grades may not always signal a learning failure to the student. Poor feedback from a professor also may not equate to learning failure depending on the perspective of the student. For these reasons, it is important to understand better how students evaluate these sources of feedback and draw conclusions about themselves and mediate their goals related to the learning failures.
I need at least one more interview with my participants to explore these ideas, if not two. This may not happen before the Christmas break. We'll have to see...

Deep thoughts on Learning and Explanation | 28 Nov 2012 (8:59am)

Ties between:

- Schank's ideas of expectation failure and explanation/understanding
- Meyer and Land's ideas of troublesome knowledge and threshold concepts
- Gong's ideas of capture, expand, teach, and evaluate
- LDS Theology

Learning is the process of coming to understand something – either about ourselves, about how to do something, or to know something. In reality, it's all related. As we seek for understanding, we attempt explanation of our experiences and perceptions. Therefore, learning consists of explanations. We attempt to explain in terms of our past experiences. When we cannot explain something in terms of our past experiences, we generate a new explanation that maximizes the coherence of our current experience with our past experience. In other words, as human beings, we are in search of a coherent explanation and understanding of all that happens to us in life.
It has been said that teaching leads to greater learning. In terms of explanation, we first learn by developing explanations to ourselves. In teaching, we often begin by sharing our explanations to ourselves with others. When others fail to understand our explanations, we do two things: 1) We update our explanation to ourselves of our experience and 2) We update our explanation of our experience to others. This is the process of educational communication. If we want to improve education, we must tackle the problems inherent in our explanations to ourselves (lifelong learning) and we must improve our explanations to our students (lifelong teaching/mentoring). We learn through teaching because it forces us to improve and expand our explanations to ourselves. As our capacity to explain increases, so does our intelligence – because our capacity to explain is a direct measure of our intelligence.
Latter-Day Saints are more intelligent than their neighbors because the Truth of God that they possess enables them to explain more of their experience and existence than their neighbors. The missionary effort is a manifestation of the altruism inherent among the Saints. The missionary effort has as its goal to raise the intelligence of the nations by increasing their capacity to explain

their experience and existence more completely and coherently. The measure of a person's intelligence has always been the coherence of their claims, warrants, evidences, and testimonies. I have found the teachings of the Latter-Day Saints to be the most coherent and intelligent of any other religious sect.

Contradiction and incoherence in our explanation represents a failure. We expect our views to be coherent. When they are not coherent, we experience expectation failure. An expectation failure signals to us that our explanation needs to be updated – we have an opportunity to grow in our intelligence. Some take the opportunity and seek to resolve the failed explanation. Others leave off resolving the expectation failure. Some explanations are not easily updated – they may take days, months, or even years to update. This may lead some to leave off updating their explanations – because the personal cost exceeds interest and perceived relevance or it exceeds the perceived capacity of the person. In any case, failure to update our explanations will lead to greater incoherence over time in our capacity to explain our experiences and we will be constrained at some point to confront the unresolved conflict in our explanations.

Some people medicate or work with helping professionals because they become incapable of resolving their conflicts on their own.

Re-Defining Learning Failure | 23 Nov 2012 (11:15am)

At the beginning of this project, I defined learning failure in terms of Scardamalia's Intentional Learning - a learner has a learning goal they are intentionally working to accomplish and they fail to do so. Now that I have gotten some perspective on the subject from students, I think I need to redefine what learning failure is. I am thinking that there are multiple levels of learning goals that students have. At the highest level they have some idea of what they want to be and do at some point in the future. For some, this goal comes after "graduation" and for others it is just an unspecified time in the future. Regardless, the students are working towards a future desirable state of life that they are not presently able to enjoy. At a secondary level, there are several intermediate goals that the students recognize need to be accomplished before they can enjoy their overarching end goal. These goals are often set by others, like teachers, whom the students perceive as being their mentors or the gatekeepers of their long-term goal. While all the learning goals of the student have some element of telic anticipation, the long-term, overarching goals have a higher degree than the intermediate goals. A career may be seen as a student's long-term goal and a degree program at a university may be one of the secondary, shorter-term goals. It can be argued that these secondary goals can be further broken down, but in interviewing students, the goals become less defined by the student and more defined by those mentors and gatekeepers. Consequently, they become less well-defined by the student and more defined by the instructor.

This theme is extremely critical in understanding why students may earn a poor grade in a college course, but not feel that they have experienced any kind of real failure. Because to them, they may have failed to accomplish a secondary goal, but they are still making progress towards their primary goal of becoming and doing. So, while professors may use grades as an indication to the student that he or she has "failed" a course, unless the student clearly sees the failure as critically impacting his/her primary telic goal, the experience may not necessarily be considered a failure by the student. This mediation between primary goals and secondary goals (or even tertiary or deeper level goals) is the core of the complex nature of learning failure experiences. One cannot define learning failure for an individual without first understanding the primary and

secondary learning goal structures and the power relationships between the student and his/her teachers.

I have not come across these themes in any other literature searches so far. The closest I have come to it is in the Intentional Learning literature, Schank's work on "Goal-Based Learning" and the work by Miller, Gallanter, and Pribram in "Plans and the Structure of Behavior." In all of this literature, however, there is a characteristic etic perspective - with the authors of the works suggesting a model, framework, etc. for how learners set goals. In interviewing actual students, it is interesting to note that students do not perceive themselves to think in terms of any of these models, frameworks, etc. Additionally, these works all focus on the idyllic or preferred view of learners that set learning goals. Little is said about how failure relates to the goal-mediation and power-mediation themes I am finding in this study. Perhaps the one exception is Schank's work on Case-Based Understanding. The work deals with Artificial Intelligence, but it does so from the perspective of first understanding human experience with understanding and then trying to model computer behaviors accordingly. Still, the connection between this literature and the larger body of educational literature is completely absent. This study will hopefully make some of those important connections.

Recent Interviews | 16 Nov 2012 (1:14pm)

I met with both Jason and Amy this week. I met with Jason yesterday and with Amy today. I am finding some amazing themes. The first is that when students don't feel connected to others in class, they often under-estimate their intelligence and they lack the courage to check their understanding in front of others. Large class sizes can intimidate or prevent students from seeking understanding from the professor, TA's, or peer students. The other theme is that the student's concept of what they will end up doing after they finish their program evolves as they take more classes. Hard classes do not necessarily cause learning failures. Hard classes, when perceived to be relevant and preparatory for the experiences the student wants to have after graduation are easily surmounted. In other words, students persist when they perceive relevance to what they conceive as what they want to be and do after they accomplish their learning goal. In this way, learning becomes a means to an end. We do not learn just for learning's sake. Students always have a goal in mind when pursuing their education. That goal may evolve over time, but it rarely goes away. The students I have worked with in this study have all changed their majors because of difficult classes, but they have persisted in their interests by choosing majors that let them focus more on what they are interested in doing after they graduate, while avoiding those experiences associated with the classes they struggle with. Jason was in the PA/PT program and switched to Communications - he envisioned himself working with people after graduation, but not necessarily in the ways he learned that PA's work with people. Amy was pre-med and switched to health education - she wanted to help people be healthy, but she was more interested in working to prevent and educate than to cure. In both cases, the student was anxious to pursue goals that consisted of being and doing after graduation that became clarified through the process of taking classes and either struggling or succeeding in those classes. Education refines our concept of what we want to do and be by helping us come to know ourselves. The idea of a student who starts out in college knowing exactly what he/she wants to be and do after graduation and then persisting through without any evolution or clarification o their end goal is unrealistic given the data from this study. I would hypothetically generalize from this study that other students experience their learning failures much in the same way that

Jason and Amy do, although the individual experiences themselves may have unique contexts and details.
I have to think more about this...

Final Participant | 6 Nov 2012 (4:03pm)

I think I want to select Amy as the final participant because she is more articulate about her experiences and she has identified more of them. In choosing her, I feel like if I stop working with Jason I will have lost out on a huge opportunity to study a different facet of learning failure experiences. I suppose this project could go on forever, but I will need to stop at a realistic point - probably at the 5 interviews I documented in the prospectus for this project. I will have to see how long Amy can hold up. I will have to find a way of communicating with Jason about the project and his terminal role in it. This is a delicate situation because I don't want to create any feelings of inadequacy in the students I work with (not that I am, but I have to be cautious of such effects).

Interview Reflections | 6 Nov 2012 (3:58pm)

I have been thinking over the last few weeks about my interviews. I have narrowed down my search to two students who could serve as the final, unique participant for my thesis study. One of them overcame the learning failure that we discussed; the other ran away from it. Both changed their major as a result of the learning failure we discussed. Both have other learning failure experiences that we could discuss. I was a little surprised how different these experiences are. Now I am thinking I should have done this study with both of these participants – one who succeeded despite the failure and one who failed because of the failure. Both of them see their initial attempts at CHEM 105 as abysmal failures. There are multiple failures associated with the class - for the same reasons between the participants.
There is something that bothers me about all of this though. Why is it that students think they are passionate about a career path until they fail at a class that is designed to prepare them for that career path? The answer I hear from professors and administrators is that they must not have been genuine in their initial passion for the subject. The failure helped them to see that they did not really want to pursue what they thought they wanted, so they changed their major. When I interviewed these final two participants, neither said that they were not interested in their initial career path, they both used the word *couldn't*. "I *couldn't* be a PA," "I *couldn't* go pre-med," etc. The new majors selected in both participant cases demonstrated that they wanted to persist in their chosen field, but they wanted to take a track that didn't require the failed Chemistry class. In other words, if there was a way to continue pursuing their chosen career without taking chemistry, they would have taken it. But that wasn't an option. So, they both changed their major. The successful student changed majors even after re-taking the chemistry course successfully. Both students also understood that the CHEM 105 class was an introductory course and that future courses would necessarily build on it. And if the foundation was so difficult, the future courses would likely be difficult too.
Some might say that this is a prime example of *grit* or the lack thereof. But I think there is something more going on here. I believe the failure experiences affected their personal evaluation of their capacity to succeed in the future, at least in the context of the failed course and related courses. This idea that initial failures can affect subsequent predictions of success by

the learner is powerful and has been studied by several researchers, especially in the 1980's. However, this correlation has been quickly passed off as a phenomenon of students' attributions for the failure. Attributions are a big part of this, but there is more to the experience.
Beyond the students' attribution for the failures lies the facts of the failure. Digging deeper into the experience, students begin to realize that their initial attributions may be wrong. In probing deeper into one of the students' experiences, he explained that he failed to connect what was being covered in class with what he envisioned himself doing in his chosen profession. As a result, he saw little relevance to learning what was being presented and disengaged. By the time he tried to re-engage to save his grade he was too far behind to catch up in the time allotted. Had he been able to see the relevance of the learning in the CHEM 105 course early on, he may have had a radically different experience in the course. During the interviews, interestingly, he came to this conclusion and modified or updated his initial attributions for his failure. And this happens all the time.
As we examine our experiences in greater detail, their significance, meaning, and relationship to other areas of our lives is updated or modified. The experience itself does not change, but its impact on our thinking and our evaluation does change. We adapt to our experiences in an attempt to control our future. The students I interviewed adapted their future educational plans in order to avoid future failures. This was not because they were afraid of failure, it was because their failures were deemed unproductive and troublesome.
This troublesome nature of the failure experiences is discussed in great depth by Jan Meyer, Ray Land, and David Perkins.

Identity and Motivation/Engagement | 29 Sep 2012 (9:10pm)

In my last two interviews on Friday I came to an amazing realization: when a student has an idea of who they are or who they want to become, they will be motivated to learn only what they perceive to be relevant to those identities. This would make perfect sense to a practicing teacher, but I have yet to find this idea in any research I have been reading.
If teachers and instructional designers understood the power and impact that identity has on learning, they would be able to use it to help prepare students to be motivated to learn what they want the students to learn.
Case in point: student A plans on being a PA, but fails to understand how his intro chemistry class topics have anything to do with who he is or wants to be. As a result, he disengages from the class and ends up changing his major. There was no reason for him to learn what the chemistry class had to offer because it had nothing relevant to offer. If the student had understood how the class topics related to what he wanted to become, he would have been motivated to learn, no matter how difficult the topics or the personal cost/investment.
This was an incredible insight!

Experience refines our understanding | 21 Sep 2012 (10:27am)

I have now interviewed a total of five participants for the Learning Failure study. I have chosen to interview two out of the five a second time to ask follow up questions and to find out if either of them will be willing to serve as the final participant for the study. The three who were not selected to continue in the study had what I would call strange concepts of failure. Two did not receive bad grades in association with the perceived learning failures. But they each had a sense

that they didn't learn what they could have and they felt that the experience was a pivot point in their lives to send them into a different discipline. Major changes may be a signal that learning failures have occurred. I should key in on that. The remaining participant had bad grades but wasn't interested in going back and improving the grades. The grades were poor but passing and a lack of interest and personal problems during the classes were the major attributions for the failures. Beyond that, there was little or no critical reflection. I believe that with some learning failures, there is a lack of motivation before and after the failure experience, which is coupled with a lack of critical reflection on the experience. The observations of learning failure experiences are significantly different from one participant to the next and no real pattern has presented itself. The two participants selected to continue participation were only selected because of there extensive experiences with learning failures and their reflective capacity. I will have to continue the interviews to get more information and detail.

In a related vein, I have been exposed to the ideas of Meyer and Land by Dr. Gibbons. Their idea of threshold concepts and of troublesome knowledge are extremely relevant to this study. I wish I had known of them before, but they are predominant only in western European and Australian education research. Basically, threshold concepts are concepts that are foundational for a learner to advance their understanding within a discipline. An example would be the idea of central tendency in statistics - without understanding this basic concept, the other concepts of regression, variance, etc. would be incomprehensible. Threshold concepts are not independent of one another, but are interdependent, both within a discipline and across disciplines. I would liken them to Polanyi's operational principles. Once understood, they open up a whole new range of possibilities within a given context.

I believe that the students I am interviewing are relating to me their experiences with these threshold concepts. Each person is going to struggle with different threshold concepts depending on their prior experience with a given content area, their recent learning success/failures, their mood, their perception of their own capacity, etc. All of these ideas were identified and related clearly by Anastasia Eflkides in Meyer and Land's book "Overcoming Barriers to Student Learning: Threshold Concepts and Troublesome Knowledge.” Meyer and Land codified concepts, but Eflkides described the relationships of the concepts - bringing in ideas such as affect, communities of practice, and metacognition. At this point, I want to take the framework of Eflkides relational concepts and use them to dig deeper into the experiences of the remaining two participants. By doing so, I will be answering the call for research outlined by Eflkides in her chapter as well as other calls for research in other chapters in the Meyer and Land book. Meyer and Land's book has identified distinct elements of learning failure experiences, but it did not describe empirical experiences of students. In other words, Meyer and Land's book outlined theories that now need to be verified through empirical research. My present learning failure study, while not fully addressing the gap identified by Meyer and Land, will be able to contribute meaningful insight. The major contribution being the description of real life experiences and the identification of themes and issues not yet addressed by current research. In this way, the theoretical concepts and their relationships can be refined and improved.

Experience refines our understanding.

Second Participant - First Interview | 7 Sep 2012 (3:06pm)

I just met with Spencer and the interview went really interesting. He talked about the difficulties of Chem 105 and attributed them to Math just like Jason did last week. But in contrast, Spencer

did relatively well in the class. But he seemed to be left with a sense that he did not learn the material as well as he could have. So where Jason seemed to be taking Chem 105 primarily to get a good grade to get into med school, Spencer seemed to really want to learn the material and in the end didn't feel like he learned it very well. This is a prime example of where grades do not always reflect real learning on the part of the students. In other words, Spencer's grade did not reflect his own sense of how well he learned the material of the course. From this idea it is possible to conceive of students who get good grades but fail to accomplish their learning goals. Conversely, we could also have students who fail all their classes and consistently achieve their learning goals. Grades and learning are not necessarily commensurate with one another. What we have to do is look at the experiences each student has, taking into account his or her goals, and seeking to understand what is happening from their own point of view. Models generally fail in this regard to describe or predict student experiences. Domain-specific techniques also fail to work for students 100% of the time, for various reasons. I am still exploring these ideas, but I am feeling more and more validated in my decision to undertake this research as I find counter-intuitive examples in the lives of students. I also feel like I becoming more and more disillusioned with the research on learning failure that currently exists. Perhaps I am running in the wrong literature circles. Speaking with Dr. Gibbons has helped me begin considering other areas of research that might correlate better with my particular approach to learning failure. Namely: *threshold concepts* and *troublesome knowledge.* I am now awaiting my final interview of the day with Macie.
Spencer may not work out for this study, but he experiences are interesting to me. I don't know that he would have enough learning failure experiences to share or enough detail associated with them. He did say he would be willing to serve as the final participant though, so we'll see what happens.

Missed interviews and meeting with Dr. Yanchar | 7 Sep 2012 (12:48pm)

I met with Dr. Yanchar this morning and had a great discussion on the thesis study and on participational agency. I really like the distilled concepts of participational agency that Jon Spackman and Dr. Yanchar have been pulling together. I am especially intrigued by the *familiar antecedents* concept. As I searched for literature for my thesis, there was a dearth of studies relating to the familiar antecedents. All I could find was fear of failure and attributions for failure. The studies were few and far between. Far more work had been done to generate models that could then be interpreted and implemented to change student behavior. It's pulling levers and pushing buttons to stop students from failing. The problem is that models reduce the complexity of reality and in the process of doing so, provide an inaccurate description of reality. So sooner or later the model will cease to describe realistic situations. When that happens, the interventions based on the model will fail and people will move on to something else. Models are used to make application to the real world through the use of analogy. We see something in the model that corresponds to the real world and we start to look for other connections between the model and reality. Some models may approximate reality very well at a given time and in a given context. Those we adopt and embrace. Other models do not approximate reality so well and we challenge them and reject them. The interesting idea here though is that as human beings, we are constantly reducing the complexity of reality by constructing and refining our own models of the world through our experiences. I suppose that this is the idea put forth by constructivism. But the discourse on constructivism gets muddied when it starts asking the existential questions related

to whether there is Truth, what can be known, how two separate conceptions of a thing compare, etc.

Participational agency is a powerful approach to agentive learning because it skirts some of the constructivist discourse and hones in on the experience of agency. Specifically, it names concepts and describes the relationships between the concepts. These names and relationships do not form a model - they form a framework, a flexible framework which is far less prescriptive than a model and but far more descriptive. Frameworks of this nature make analogy or *transfer* much easier for practitioners and learners and so are more successfully adopted. In other words, people see themselves fitting into these frameworks more readily than they are able to coerce their experience and understanding into a reductionist model of reality. The power in all of this comes from helping people to make sense of their experiences in a way that adds value to their existence. With that aim in mind, I undertake this research to begin understanding the experience of learning failure and to identify themes and concepts that relate to one another. If I could provide such a descriptive framework, we could begin to develop more focused interventions and conduct more productive research that would result in helping students succeed at their learning goals.

So I am excited about this study...

My first interview today, David, did not make it for the interview. He still wants to meet, but was tied up at home. I will have to see if his participation is necessary. If he is having these kind of time and transportation issues, then perhaps it would be too difficult to continue to meet with him and finish the study. I invited him to interview with me next week, but we will have to see how things turn out. He did mention struggling with Chemistry and Politics in the current semester, so perhaps he may have learning failure experiences that are of value to the study. I will wait to see what happens next week.

Dr. Gibbons showed me a "triangle of choice and judgment" with several influences affecting everything that I found intriguing. As I continue in the study, I would like to ask questions about these influences and about Yanchar's PA as they relate to these experiences. This study is seeking to fill a big hole, and I believe that this study may only throw a teaspoon of beach sand into it. We will see how it goes from here.

First Interview reflections | 1 Sep 2012 (12:05pm)

I had my first interview yesterday morning. It lasted roughly 40 minutes and went well. The participant agreed to meet again and to serve as the final participant if selected. That was good. We got into one learning failure experience, but at a pretty surface level of detail. We mainly talked about a specific course. It sounds like there were at least two other courses/experiences that can be discussed, so that was a good sign. I plan on reviewing the audio and transcribing this week. Some of the themes I saw in the interview were:

- Fear of failure did not seem to be a part of the experiences we discussed
- Attributions for the failure included poor ability in math and lack of clear learning goals
- Past failure and the prospect of future failure in the same domain did not seem to deter the participant
- Long-term goals and the participant's motives for achieving them provided the energy and resolve for working through the failure

Additionally, I met with Dr. Gibbons and we discussed the proposal I sent him to do a development project related to learning failure. We spent a good amount of time trying to dig deeper into the issue. We reviewed my literature search terms and decided they were inadequate. We realized that the metacognition literature is really at the core of my interests with learning

failure. That was a revelation. It took Dr. Gibbons pushing me to get clear on what my interest really is with learning failure. One of the great experiences in our conversation was a point in which we each generated and swapped narratives of possible situations involving learning failure in which my personal interests played out. We talked about these narratives and how the learning failure interventions we were discussing were irrelevant. What was of interest was what was happening within the learner during the learning failure experience. I wanted to understand how explicit metacognitive processes within the learner were taking place. We discussed a triangle of choice and judgment developed by Dr. Gibbons, which was influenced by the ideas of Miller, Gallanter, and Pribram in their work "Plans and the Structure of Behavior." We talked about the role of learner agency inherent in the learner metacognition. This agentive metacognition during learning failure is at the heart of what I am interested in. I want to understand it through the cross-case analysis of my thesis study and then begin supporting the agentive metacognition through the development of a mobile app. This may be like putting the cart before the horse - to start trying to develop an app before laying down a solid understanding of the phenomenon, but I believe that the two processes are complementary. I believe that this approach will help me to better refine my ideas and focus both the research study and the development project.
I am excited to see what happens with all of this going forward.

Participants are coming in! | 17 Aug 2012 (11:03am)

It has been a little over a week since I communicated with the college advisement chairs in Life Sciences and FHSS. So far I have four participants that have expressed interest in meeting with me. Since the invitation email was basically a reiteration of the consent form, we shouldn't have too many surprises there. At this time, each of the participants has told me that they are away from campus for the summer and will not return until next week. So, I will have to wait to conduct interviews until then. I think that the beginning of the semester may be a good time to do the interviews - before everyone gets busy. I may even get lucky and be able to interview students as they go through a learning failure experience this semester. One another note, I have been thinking about the idea of experience closure. I don't think that the term is in the literature, so the way I define it is that it represents some demarcation of the end of an experience. There are many ways that this can happen and this is the point that I am so interested in. I had the thought today that many adults struggle with a lack of closure at the end of their experiences. This leads to cognitive overload as well as imbalance in cognitive, emotional, and physical energy. There is a period after the experience closure and before the new experience that I believe is critical. That is the time when we try to make sense of the experience that has just ended through the Piaget model of assimilation/accommodation. I do not have these ideas fully developed yet, but their relation to learning failure experiences cannot be understated. I believe that lack of closure of learning failure experiences is one reason for the experiences being so impressive to us. We want closure, but the failure prevents the closure. So, the experience bothers us until we either suppress it or work through it. It's when we can't suppress or resolve the failure that things get really bad. Anyhow, these are just thoughts. But even great ideas are foggy at the first...

First study participant | 6 Aug 2012 (2:04pm)

I received an email from Macie this morning stating her interest in the learning failure study. I replied asking for a good time on Friday when we could meet and interview. She is from the psychology program, so I guess the invitation got sent out. I was never notified or cc'd on the messages like I requested. Oh well. I talked with Dr. Yanchar last week about my progress. He pointed out the wisdom in piloting the interview questions. I agreed and we decided that the first-round interviews would be a kind of piloting of the questions. In thinking about the interview protocol, I think the questions are good, but I am going to have to keep bringing the conversation back to the learning experience. The major concern that has been expressed is that students will state all sorts of reasons for their learning failures without really articulating the failure experience itself. I am planning on trying for a narrative tack in the interview process - helping the students paint that rich description of the experience that I need to do the cross-case analyses. I am not really worried about the protocol design or about the questions. I think that it will all come together as I continue to work with participants. I am a little worried about what my committee and other involved researchers think about my process, but in all my research into qualitative methods, I believe I am doing just fine. So I will see how things go with this first interview and decide where to go from there... I love exploration studies!

Holes in our understanding | 25 Jul 2012 (9:54am)

Here are some related (but disorganized) thoughts about our minds, learning, Piaget, and Roger Schank: Holes in our understanding Piaget's assimilation and accommodation ideas Bigger holes attract more of our attention We get to a point where we tolerate a certain hole size and don't worry about it anymore. Kids don't have that toleration – or it may be that it is less toleration for the size of the hole. This leads them to be curious about everything. They are trying to fill in the holes. Our understanding is like an ever expanding fabric or tapestry. It has holes all over it, but with time, some areas are more complete than others. The reality of it though is that the fabric represents only a fraction of what can be known. Epistemology is the study of the fabric of our understanding. We fill holes that are easiest to fill first. It takes effort to discover. It also takes humility. It would be as if Columbus chose to believe that all of the world was already known and so there was no need to go on to discover more of it. In our day, most of the world is mapped, but very little of it is understood. Ontology is the study of the nature of the fabric, what it is, how it came into being, what its meaning and purpose are, etc. Just because something exists does not mean it is understood. Epistemology and Ontology work constantly in tandem with one another. Imagination is our capacity to fill in the holes in our understanding. We say that people have little imagination who are no longer curious about something. The truth is, everyone is imaginative, but over time, their hole-filling becomes confined to smaller and smaller spaces of interest. This does not render them any less imaginative. Our capacity to fill holes never goes away. We just tend to prize those imaginations who roam over the whole fabric of understanding with seeming delight and ease. Roger Schank was right about expectation failure. It is a starting place for Piaget's assimilation and accommodation to occur. But what happens next is virtually unexplored. Schon's reflection-in-action is a beginning attempt to explain the skill, but it leaves out details – perhaps because the experience is different for everyone. Even so, it is imperative for each of us, individually, to understand how we fill those holes – first, so we can understand ourselves and second, so that we can improve how we fill those holes. It really is an incredible idea – learning. Learning is the intentional filling-in gaps in our understanding. Understanding in this sense also includes skill – or understanding how to do

something. Understanding is also not restricted to the definition that Bloom placed on it in his taxonomy. Rather, understanding refers to knowing and doing. To say someone has understanding is to say that he or she knows something or is skilled at doing something.

IRB Approval | 23 Jul 2012 (3:12pm)

I have finally secured IRB approval for my thesis work. Now the real work begins! Unfortunately, I may have to submit an IRB amendment due to the fact that I have been refused the opportunity to work with either the Freshmen Mentoring Office or the Academic Support Office (ASO). Julie Preece of the ASO gave me the names of a handful of Academic Advising Centers who have high rates of learning failure. She advised me to send my recruitment email through the centers so as not to target the failing population (that didn't make a whole lot of sense to me, but I am going to trust her judgment). As I get deeper into this process I realize the danger of letting others represent my research. Most people are not reading the prospectus I send them and they are making inferences about the study based on their own experience and biases. This is all the more reason for me to be doing this study. I am seeing a lot of preconceived notions about learning failure and how college students experience it. The "experts" have a perspective that I would label almost entirely etic - seeing with their own eyes and not through the eyes of the students themselves. Ironically, most of the people I am trying to work with on this study are trained clinical psychologists, which often carries with it a whole set of terms, theories, ideas, and notions that run counter to the kind of research I am doing. I wonder why people have such a hard time bracketing their biases and experiences to go exploring with me. Perhaps it is uncomfortable for them or perhaps they don't know how to "make the familiar strange" as Stake suggests...

Thoughts on being an academic | 27 Jun 2012 (9:35am)

Being honest and humble about what we don’t know leads to greater learning and understanding. It may appear that some of the greatest minds of the times are those who have embraced arrogance and pride of the basest sort. A close inspection of the contributions of these reveals that their insights are typically descriptive, not generative. In other words, their contributions are terminal – failing to lead others to greater learning. The humble are teachable because they are honest about what they don’t know and they recognize that there is always someone else that knows more than they do about what they don’t know. The wisest and the most humble learners will implore their omniscient God for learning and instruction. There are at least two main impediments to humble learning: 1. The proud look upon what they do not understand with disdain, considering it to be of little importance or significance in their conception of things. 2. Even more dangerous than the first is that the proud believe that they have already understood a thing, when in fact they have hardly any understanding of it at all. This latter impediment is almost impossible to overcome without the individual completely abasing himself and acknowledging to himself and others that he is a fool and is in need of being taught. The biggest mistake of the academic is the development of self-conceit and an identity as the final authority on some matter. This is secular priestcraft and is always unstable. The true academic is openly a master learner, whose skill is in learning and imparting constantly to his fellowmen all that he knows and feels – with a constant acknowledgement of his own imperfect and developing understanding.

Seasoned Research | 12 Jun 2012 (2:02pm)

The more I talk to seasoned researchers, the more convinced I am of the need for my thesis work. The common approach is to come up with a general definition of some construct and then go out to see who fits the pre-conceived mold. This is the foundation of quantitative research, but it is the antithesis of qualitative research - it is an anti-exploratory approach to research. I have been pushed to define what I mean by learning failure. I don't know how to explain to other researchers that I am not interested in my own definition, because in reality, I don't think it makes a lick of difference to a student what I think learning failure is. They are going to have their own idea. I want to know what their ideas are and why. I want to know what their experience is like - from their perspective. Perhaps this is an extremely naive perspective or goal, but I am still waiting for someone else to tell me a better way to get a student's perspective on their failure experiences. Another issue is that seasoned researchers fail to posit any confidence in their research subjects to give them useful data. I was trained that the researcher's skill is to work with the subject to elicit the desired information - without leading the subject to etic conclusions (i.e. confirmation bias). I have yet to meet educational researchers that believe students are competent, thinking individuals. Too often they are seen as being over-manipulable. Just some thoughts.

IRB is in | 7 Jun 2012 (10:13pm)

I submitted the IRB application yesterday morning. I am hoping for an expedited review since I am not shooting students in the leg with high velocity tennis balls... I am excited to get into the meat of this research project. Dr. Gibbons seems like the only one with reservations so far. In talking with him though, I think it is just my poor writing that is getting in the way, which is something that I will have to make sure that I get right in the final report of the project. In anticipation of the IRB approval, I have been out looking for more articles and writings on learning failure. I listened to an interview with a Harvard Business School professor discuss her latest article on learning from failure. I was a little disappointed, as always, that the discussion stayed so high level. I feel like people are trying to come up with the million dollar solution before fully understanding, and appropriately framing the issues. My research project is designed to help characterize learning failure experiences in college students much better than has been done in the past. I am hoping to characterize them in such a way that the complexities and multiple themes emerge more clearly. I think I can do this by documenting and analyzing three separate learning failure cases of a college student. Once learning failure is better characterized, then we can begin framing some of the issues in a way that lend themselves to solutions and nine-step approaches, etc. Anyone who proposes solutions before understanding the problem, or in the very least, documenting their understanding of the problem, is wasting everyone's time with something that may work today, but will be obsolete tomorrow as our understanding of the problem evolves. I am beginning to see Dr. Gibbons' wisdom of having our IP&T 664 class spend so much time exploring the design problem of the Thanksgiving Point exhibit metaphor. We all wanted to rush in and start creating something, but he kept us mucking through the abstractions until we were comfortable with them and confident that we had thoroughly explored them. Our design outcomes from that experience were a testament to that wisdom. It is good that I document my thoughts now. I read this and think the comments may sound arrogant to others

reading this. I don't mean to be arrogant, I am just documenting my current thinking, with full expectation that I will look back on this and realize how naive I was before the project...

Detail in Writing | 3 May 2012 (12:34pm)

Detail in writing is a balance between simplicity and information. You should be clear on your purpose for writing, your audience, the main points you want your readers to come away with, and then you should state your points as succinctly and clearly as possible. Fewer, well-chosen words are better than a page of empty vanity.

Argumentation | 3 May 2012 (12:32pm)

I have learned today that argumentation has two key elements: 1. Focus on the conflict points of the argument - what is the claim being made and what are the views that conflict with it? 2. Use supporting literature to demonstrate the reasonableness of the claim and the unreasonableness of the conflicting views. This is an oversimplified explanation, but it helps to narrow the construction of an argument to two major objectives. This reduction helps focus the writing and strengthens its capacity to convince.

2nd draft of prospectus | 27 Feb 2012 (11:26am)

I got feedback on the 2nd draft of my learning failure study prospectus. Each revision is tighter and cleaner. I feel like the hardest challenge has been to summarize a diverse set of research findings. There is so much out there that gets into specific phenomenon related to learning failure that it is almost not worth summarizing. We need to develop a greater understanding of learning failure holistically, which is the opposite of what prior research has done. A more holistic understanding of learning failure can tie ideas and research findings together in a way that creates value for practitioners that are working with learning. Right now, I could only use learning failure research findings if my specific learning context aligned with those identified in a given study. Perhaps what is needed is a framework for understanding learning failure research cohesively and productively.

Presentation Results | 18 Jan 2012 (8:44pm)

I presented today and I felt good being able to lay out my ideas. Unfortunately I don't know how well the ideas were received. We didn't get any feedback as there wasn't time. But several people engaged me afterwards and asked thought-provoking questions. That was my real intent. I hope to continue engaging people - especially professors - in dialogues about learning failure. I don't know how they took my presentation today, but I hope they were provoked into thinking more about failure.
What we really need is a Krippendorf *discourse* on learning failure...

Presentation Today | 18 Jan 2012 (9:23am)

I am going to make a Pecha Kucha (PK) presentation to the IP&T department today about my intended research on Learning Failure. As I prepared the presentation, I realized that there are some difficulties that I will have to overcome in doing this research.

- People do not agree on what learning failure is - it is identified differently by different people, but it is identifiable
- There is far more research bent on reducing learning failure to factors and variables than research seeking to explore different themes from the student perspective
- Learning *from* failure is a major theme in the *other-than-education* literature - but learning *about* learning failure is not

There are other difficulties associated with this research. I am anxious about and excited for the opportunity to field questions about my research today in the presentation. I believe that the more questions I field now, the better prepared I will be to make my defense for my Thesis prospectus. I am also finding that there is real power in re-writing my lit review section of my prospectus. This is really where I can strengthen my argument and prime the pump for a productive research experience. I am extremely grateful for willing professors who are helping me to improve my work.

Learning Failure Research | 14 Jan 2012 (2:34pm)

I am convinced more and more of the importance of understanding failure experiences better. We really struggle to know what to do to help students move forward when our "time-tested" tools of instruction fail. I believe that instruction should not only be *generative*, but also *adaptive*. Adaptive in this sense refers not just to adaptive to learning *style*, but also to learning *experience*. I want to explore these themes more fully with my research on college student learning failure.

Stake multi-case analysis worksheet #2

Worksheet 2. The research questions or themes of the multicase study and factors that might be used in a more quantitative study.

Theme 1: How does a college student reflectively describe and explain his/her learning failures?
Theme 2: What are the important themes of learning failure experiences from a college student's perspective?

Stake multi-case analysis worksheet #3 – Amy – Chemistry course

Worksheet 3. Analyst's notes while reading a case report

Case ID **– Chemistry – Amy**

<table>
<tr><td>Synopsis of case:

Amy took chemistry three times and never earned a passing grade. According to her interview, her two goals were to earn a passing grade and to master the course concepts. She struggled to understand course concepts, even after repeated course attempts. She also struggled to form strong social ties with the professor or her fellow students.</td><td rowspan="2">Case Findings:

I. Amy's social anxieties had a major impact on her learning failure.
II. Amy's struggles to understand course concepts within a useful framework had an impact on her learning failure.
III. Amy's self-doubts led her to disengage from the course multiple times.
IV. Amy's learning successes counteracted her self-doubts that arose from her learning failures.
V. Amy's perception of her class role in relation to other students led her to avoid getting the help she needed with her learning failure.
VI. Amy's orientation toward effort attributions for her learning failure impeded her getting the help she needed to work through them.
VII. Amy's learning failure in the course did not mean she didn't learn anything in the course. Her learning failure signifies that she failed to learn as much as she intended to learn.</td></tr>
<tr><td>Uniqueness of case situation
for phenomenon:

This case focuses on Amy's failure to understand the course concepts, even after repeated attempts. This is an unresolved learning failure.</td></tr>
<tr><td>Relevance of case for cross-case Themes:
See below</td><td>Possible excerpts for cross-case report:
Refer to corresponding Comments page</td></tr>
<tr><td colspan="2">Factors (optional):</td></tr>
<tr><td colspan="2">Commentary:

Amy's effort attributions could be a result of the university culture: if you're in college, you should already have the learning skills needed to be successful. If not, then you are deficient. This kind of culture that emphasizes self-reliance and completion over help-seeking and collaboration reinforces an effort attribution orientation.

The opposite of "confusing" is "not confusing," as opposed to "clear" or "understandable." Just</td></tr>
</table>

because Amy worked through something that was "confusing" does not mean that she came away understanding the concept. She just ended up less confused about the course concepts than she was initially.
Depending on the student and the learning failure experience, learning goals/intentions are probably modified and updated throughout the experience. It would be extremely important to understand how learning failures affect the moderation of learning goals/intentions.

*** Amy has persistent shame associated with the learning failures in this course. The learning failure compounded with the self-doubt left a lasting impression.

*** Amy did not expect to take this course multiple times without passing it. This violated expectation led Amy to see it as a learning failure.

*** The opposite of "confusing" is "not confusing," as opposed to "clear" or "understandable."

*** Amy may not be able to perfectly recall all of the course topics and describe their relation to one another, but she has retained some important ideas from the course. Learning did take place in the course, just not to the degree that Amy had intended.

*** Amy describes herself as a "little person" in relation to the other students. Her perceived role was insignificant in comparison to the other students and the instructor.

*** Amy lacked the confidence to ask the teacher for help. What she may have meant is that she was ashamed to ask for help because of her effort orientations. She felt like there was more she should have been doing to learn the concepts before asking the teacher for help. This is a common help-seeking trend.

*** Amy says that "pride issues" got in her way of asking for help. I think what she is saying is that she began to realize that just her efforts alone were not going to lead her to understand the course concepts. She had to overcome her social anxieties and get repeated help in the course. Amy relied on the course textbook to provide her with a conceptual framework. From these interviews, it appears that it was inadequate at providing Amy with a framework that she could use.

Self-doubt

Amy remembered the feelings of self-doubt created by her poor testing experiences in this course. She learned from her learning failure that she wasn't as strong a learner as she thought she was. Her learning failure led her to doubt her ability to learn in other courses at the university. This self-doubt negatively impacted her engagement in the course. However, once Amy understood a concept, she had really positive feelings about the learning success, which counteracted some of the self-doubt.

> Chemistry I learned was something that didn't come easily to me
> With chemistry early on I remember the feeling that I had coming out of the testing center late at night, doing as much as I could, being kicked out of the testing center

> because it was closing, trying to fill in random bubbles and just the feeling of walking through campus thinking, "I shouldn't be here. I cannot do this. I'm not as good of a student as BYU deserves or as BYU requires."
> the feeling that I had coming out of the testing center late at night, doing as much as I could, being kicked out of the testing center because it was closing, trying to fill in random bubbles and just the feeling of walking through campus thinking, "I shouldn't be here. I cannot do this. I'm not as good of a student as BYU deserves or as BYU requires."
> That's the one that I think I'm a little ashamed about it. Just because I started it maybe even a couple of times and the third time I kept through it and still did not do very well. And I think in the beginning, the first time I started it I already started out being nervous about it because people told me it was a hard class. And for me, I already had this perspective of myself that "I'm not a very good student. I don't do well in hard classes" and that's what was going on. A part of it I think was that when something looked hard, I didn't feel like working on it because I knew I would fail in a sense. Or I knew I wouldn't be able to do as well as I wanted to and so it would be hard to get the motivation to actually do the homework.
> That's the one that I think I'm a little ashamed about it. Just because I started it maybe even a couple of times and the third time I kept through it and still did not do very well. And I think in the beginning, the first time I started it I already started out being nervous about it because people told me it was a hard class. And for me, I already had this perspective of myself that "I'm not a very good student. I don't do well in hard classes" and that's what was going on. A part of it I think was that when something looked hard, I didn't feel like working on it because I knew I would fail in a sense. Or I knew I wouldn't be able to do as well as I wanted to and so it would be hard to get the motivation to actually do the homework.
> But I remember that those details sometimes intimidated me too. Because for me, I see something and I think "that's too hard for me" – that's that initial thought. And then sometimes I don't want to learn the details – I don't bother to learn the details because I think, "that's beyond me."
> Whenever I did finally understand it, it felt really good.

Learning failure

Amy's original goal was to earn a high grade in the course. After here initial learning failure, her new goal was to avoid failing the course. She also wanted to understand the explanations of the instructor. She struggled to work through the "confusion" associated with the course concepts until they were no longer confusing. She wanted to master the course concepts, but failed to invest the time necessary to master them.

> Chemistry I learned was something that didn't come easily to me. So I tried it a few different times.
> I would start the course and then realized it was going to be too hard for my schedule and then drop it just before the add/drop deadline or the withdrawal deadline. So that was the first couple times I tried to start Chem 105. But then the third time I took it and kept through it and I didn't fail it.

> So that was good, but I didn't do amazing. I think that's part of me being a perfectionist and then using perfectionism as a way of procrastination and then just not doing something.
> I think conceptually, trying to understand some of the things the teacher taught and trying to figure it out in my mind was difficult.
> It was confusing and it took a lot of work for me to realize what the polarity would be
> I don't think I ever felt like I had mastered it.
> But I definitely could have if I had put in the time and the hard work and everything for it.
> I remember learning about them.

Learning strategies

Amy consistently showed up late for class, which contributed to her learning failure.

> And I would always be late. That was another bad thing on my part. I was always late, so I would always be sitting on the stairs along the sides. And I wasn't the only one. There was always a ton of students. So, being a little person over on the side of the stairs that walked in late, I would feel even worse about asking the teacher a question and making him go back.

Instructional strategy

Amy remembered the good instructional strategies related to learning about dimensional analysis. The instructional strategies for other topics were not as helpful.

> If it's anything like I remember, the teacher had this really good visual aid for understanding dimensions of different things. He had balloons that he would use to show that when you tighten the strings on any of these balloons they'll automatically go into a certain formation and that's how this kind of molecule would be. When you take off one part of the molecule then the balloons automatically shift and go into another type of dimension. It's like you pop a balloon and the balloons, you shake them and they automatically shifted to a new position and you would see the little formation they made. He said, "this is how it would be like this" and then he would continuously pop a balloon. I remember that was a really good way to finally figure it out. I had to really see it.

Social anxiety

Amy's learning failure happened because she did not ask for the help she needed. She didn't want to inconvenience the professor or the other students because she perceived that she was the only one struggling with the concepts. She also felt underprepared for the course because she did not take a chemistry class in high school like many of the other students. Amy felt inferior to the others in the course because of her learning failure and because of her perceptions of the relative successes of other students. She also felt that the large size of the course and the poor seating arrangements contributed to her learning failure.

Chem 105 is a huge class! And so there were multiple days when it's in one of those rooms that have the big stadium seating and it's got, probably 100 or at least 80 students in our class. And so all the seats would kind of fill up on the outsides and you wouldn't want to climb over a ton of people.

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I would feel even worse about asking the teacher a question and making him go back. I was sitting in class listening intently and I still didn't understand it. I needed the teacher to go back to the very beginning and re-explain it in a different way. But all the students around me looked like they understood it. They were all asking these questions that apply to it and I felt like I wouldn't even know how to ask a question because I just didn't understand it. I would be in class and the teacher would just lose me in the beginning but then he would just keep going and I wouldn't want to make him go back. So many students looked like they were perfectly smart and I always had this bad perspective of myself where I felt like I was the only one who didn't understand and everyone's going to think I'm stupid if I make the teacher go all the way back.

So, being a little person over on the side of the stairs that walked in late, I would feel even worse about asking the teacher a question and making him go back. I was sitting in class listening intently and I still didn't understand it. I needed the teacher to go back to the very beginning and re-explain it in a different way. But all the students around me looked like they understood it. They were all asking these questions that apply to it and I felt like I wouldn't even know how to ask a question because I just didn't understand it. I would be in class and the teacher would just lose me in the beginning but then he would just keep going and I wouldn't want to make him go back. So many students looked like they were perfectly smart and I always had this bad perspective of myself where I felt like I was the only one who didn't understand and everyone's going to think I'm stupid if I make the teacher go all the way back.

And I think because of that perspective I had in the beginning it already made me not want to really study which would have been the thing that would've helped me. If I had felt comfortable enough to go to the teacher and say, "I don't understand this. Can I meet with you?" Then, I would've been so much better! But, I just wasn't confident like that at all.

And I think because of that perspective I had in the beginning it already made me not want to really study which would have been the thing that would've helped me. If I had felt comfortable enough to go to the teacher and say, "I don't understand this. Can I meet with you?" Then, I would've been so much better! But, I just wasn't confident like that at all.

I've talked to other people about this. I would tell them "This is my first chemistry class in college" and they would say, "Wait. You didn't take it in high school?" And I would say, "Well, I did physics in high school." At my high school you could take one or the other for that requirement.

I've talked to other people about this. I would tell them "This is my first chemistry class in college" and they would say, "Wait. You didn't take it in high school?" And I would say, "Well, I did physics in high school." At my high school you could take one or the

> other for that requirement. Chemistry was just a little more conceptually harder to understand for me.
> The second time I got it a little bit better. I think it took the TA helping me. I would go to lab even if I felt ridiculous asking again and making the TA explain it in a different way and actually reading every word in the book and not just skimming. So that's when I finally tried to get over my pride issues – having to ask yet again because I still didn't get it {…} But I think it was really just applying myself and having it explained to me in different ways and then reading it again from the book. I remember I had to have it explained and then I would say it back. If I said it wrong they would say "no, no, no" then they would explain it again in the same way. As long as I said it back in the right way, that's when I thought, "okay, I think I understand." The interaction helped a lot. And even if someone explained it again the third time, finally the first one clicked. For me it's just going through the grueling process of talking about it again and again and again and then finally I can understand it.

Effort attribution

Amy's tried to learn the course concepts on her own, but what she needed was help from someone else. She expected to understand the course concepts easily and when she didn't, she attributed the learning failure to a lack of effort. She felt like she wasn't putting enough time into the course. Amy thought that she could just "keep going," putting more effort into the course even though she was not learning the concepts.

> Eventually I realized that "I'm just going to keep going and it doesn't matter what people do or think or what they understand. I'm just going to make sure I can keep understanding this." So I think that I barely got by with the homework assignments because it was still just harder for me to understand.
> It could also be that I just didn't put in the time that it needed.
> It just didn't come very easily to me. It could also be that I just didn't put in the time that it needed.
> But once you got it down, everything else built on it. So you had to get that down. And I remember the first time I took chemistry, trying to understand moles didn't quite click, but I thought I would just keep going. And I couldn't really understand it – the whole concept of moles in the beginning.

Conceptual framework

Amy expected that the course concepts would follow predictable laws that would make sense within a framework. The apparent lack of "predictability" of the course concepts made her learning failure worse. She believed that there was a "right" way to understand the course concepts that continuously eluded her. She felt that the course concepts did not relate to anything that she was familiar with and so she struggled to reform her ways of thinking to accommodate the new ideas. Amy had the beginnings of a conceptual framework for the course concepts because of previous experiences, but her framework was not sufficient to tie together all the concepts in a coherent way. She came away from the course "less confused" instead of "understanding" the course concepts.

I think conceptually, trying to understand some of the things the teacher taught and trying to figure it out in my mind was difficult. And sometimes books have different kinds of diagrams in them to try to explain one principle. For me when I have a lot of different diagrams it confuses me as opposed to if it just had one diagram that it would keep teaching from. I think they're all about something different and I can't picture it in my mind. Then trying to memorize all of the little molecules and then how you put them all together was hard for me.

I think things got hard when he started to get into the basics of organic chemistry. Just trying to understand what the basic molecules were and how they would fit together, how that would change the polarity of the molecule and trying to understand what direction it would go in, etc. was hard. Because somehow when they combined, the shape of the molecule changed. Sometimes that was confusing to me, unless I had the little things that people put together. I never really played with those.

It just seemed like there were so many little details that would cause it to act in a certain way that it wasn't as easy in my mind as a 1 + 1 = 2 sort of thing.

It bothered me that it didn't fit with any other form of measurement that I had known before and that it was its own thing. You had to learn that from scratch again. You couldn't relate it to things as much.

I guess maybe I kept feeling like it was unpredictable.

I guess maybe I kept feeling like it was unpredictable. That's how it seemed. But I think what the teacher was probably trying to explain was that it is predictable and that there is a certain pattern – you just have to get it down. That was probably it. I couldn't really figure it out.

I think I remember the initial struggle of learning it and then it did eventually come but I don't think I ever felt like I had mastered it. So, there were some stages in between where I thought, "I can kind of understand this" because of my base with other things.

I recognize all these names. I'm trying to remember the homework assignments. If I could just look through the book and flip through the pages I would be able to remember, "that was good" because I had been through that book – not completely because the chemistry book is like one hundred pounds.

Stake multi-case analysis worksheet #3 – Amy – Statistics course

Worksheet 3. Analyst's notes while reading a case report

Case ID **– Statistics – Amy**

<table>
<tr><td>Synopsis of case:

Amy failed to understand the course concepts the first time she took the course. But the second time she took the course she began to understand the concepts.</td><td rowspan="2">Case Findings:

I. Amy filled in the gaps in her understanding by taking the course a second time.
II. After resolving her learning failures, Amy decided to pursue additional training in statistics.
III. Conflicts between course information and information available on the internet contributed to Amy's learning failure.
IV. Amy's stronger relationships with the instructor and the TA's the second time helped her resolve her learning failure.
V. Amy failed to understand the course concepts because they did not relate to other concepts, like math, in the way she expected.
VI. Amy like subjects that she understands. Her attitude towards the course concepts shifted once she understood them.</td></tr>
<tr><td>Uniqueness of case situation
for phenomenon:

This case demonstrates how Amy experienced a learning failure and then resolved it by taking the course a second time.</td></tr>
<tr><td>Relevance of case for cross-case Themes:
See below</td><td>Possible excerpts for cross-case report:
Refer to corresponding Comments page</td></tr>
<tr><td colspan="2">Factors (optional):</td></tr>
<tr><td colspan="2">Commentary:

Amy has repeatedly mentioned the power of relationships in helping her succeed in a course. More than just instructional strategies and pedagogy, these relationships reflect the way that Amy feels about the instructor, the TA's, and other students. When this feeling of connectedness is present, she thrives; when it is not present, she struggles.

*** Amy like subjects that she understands. Her attitude towards the course concepts shifted once she understood them.</td></tr>
</table>

Learning Failure

Amy wanted to get an A grade in the course the first time that she took it but she quit because she couldn't understand the concepts and she did poorly on the homework.

> I've seen this with myself whenever I do something that proves to be difficult for me, I hit this wall and I say, "oh! I don't want to try this anymore!" And that's when I drop the class the first time.
> I just couldn't quite understand the concepts. So I if I did do the homework I did poorly on the homework.
> So, when it clicked I could stay awake. The second time I took Stats 121 it just clicked and I got an A. It's just the basic stuff.
> The first time it was like I just didn't get it and it all went over my head. There were proportions and trying to understand definitions. Because in stats it's not as much math as it is understanding definitions.

Hard Concepts

Amy failed to understand the definitions of the course concepts because they did not relate to her past experience with math and other concepts that she thought should be related. She was confused by the difference between BYU definitions and definitions that she came across on the Internet. She also struggled to understand how the course concepts applied to real life.

> I think part of it's hard because the concepts are hard. Statistical things aren't always easy for people to understand. I think there's a lot of trying to understand these statistical procedures and how they apply to a real life setting. I think that's part of it.
> I think the hard thing the first time I went through the stats class is that the BYU stats particularly has its own kind of language for stats as opposed to the rest of the world. So they have their own terms I think that they use for certain things. And sometimes I would just randomly search for things on Wikipedia and it would be slightly different. I realized that I had to forget Wikipedia and studying things on my own and just focus on the BYU stats. I noticed that BYU has its own stats terms and that's one thing – learning the terms for certain things.

Analyzing problems

Amy's lack of ability to analyze and understand the assignment problems contributed to her learning failure.

> I think part of it was just trying to organize it all in my mind. Because there's a bunch of different formulas for different situations and so it was trying to read the situation and understand which formula applied. That was something that I just could not figure out how to organize in my mind. And now I can read a problem and think "oh yeah! I need this formula or that formula."

Study strategies

Amy was able to resolve her learning failure by improving her study strategies.

> So I learned more how to write all over my formula sheet and my book and my notes and just be willing to make a mess out of it. But the more I write, the easier it comes to me. Or if I draw things – I have to be actively doing something with my hand. So rather than just typing out notes, I have a notebook. And actually, when I was a training to be a TA, I would go back and review my notes from when I was a student, and that would help me figure out how to teach it better. I think I combined in the same notebook my notes from the first time I took stats and the second time. So the first time, I would be falling asleep and it was so sad and then the second time I would have really good notes.

Time management

Amy struggled to manage her time across her classes, which contributed to her learning failure. When she put in the time to go to the labs she was able to learn the material.

> I think I hesitated and probably waited to do the homework for it until last. And then I ended up not always being able to always do it because it was harder homework. So, I got done what I could.
> Other parts of it was just making sure I had time in my schedule and forcing myself to go to the lab. And not just the scheduled lab that you sign up for that you have to go to get a grade for, but also the open lab. And I had to make sure that I went to that even if I didn't want to and that I needed to even if I didn't want to.

Confidence issues

Amy was not confident in her ability to understand the course content. She built her confidence by relying on help from siblings who had already successfully taken statistics.

> It definitely wasn't a big confidence feeling going into that class. But, I did think, "Well, I do have to take this class for this or that, so we'll just see how it goes." I had an older sister that took statistics and she liked it. But, that was in high school, so it was probably really simplified. And I thought, "well, I've got family who understands statistics. And I have an older brother who did a lot too. So, maybe it will work out."

Social dynamics

Amy's stronger relationships the second time she took the course contributed to her success. She persisted when she had others encouraging her to work through her learning failures.

> Then there are other people there that say, "come on! You've got to keep doing it!" or I have to take the class and so I have to learn it at some point and I keep forcing myself. The second time I went through stats, I had a different teacher and different TA's. And that's another thing. I loved the TA that I had the second time. The first time he was a

> little confusing. The second time I think she was a lot more experienced. So she would watch our faces and when she could tell that we were still confused she would explain it in a different way, "what about this? Okay, what about this?." And so that was another nice thing – that she was willing to review it again and again until she could tell that we were understanding it. Like when the light came to our eyes. That was really helpful – TA's that I could talk to. Plus, I was in a tiny class (the second time) that only consisted of three or four students. It was a special situation where we were on a stats portal for homework assignments as opposed to this "my-stats-lab-homework-thing" program that they were testing out with everyone else.

Remediation

Amy was able to resolve her learning failure the second time she took statistics because she was able to fill in the gaps in her understanding. Resolving her learning failure led Amy to pursue additional opportunities for learning statistics.

> So with that base of hearing it the first time and kind of starting and then hearing it again from someone else's mouth a different way, I thought "oh, that totally makes sense."
> It was like Stats was just wonderful. I actually went through a couple of semesters of training to be a TA for Stats. And then I realized I couldn't fit it into my schedule, which is sad because I did training to become a stats TA. But I wasn't actually a Stats TA. So, now I like stats because I understand it.
> So, now I like stats because I understand it.

Stake multi-case analysis worksheet #3 – Jason – Chemistry course

Worksheet 3. Analyst's notes while reading a case report

Case ID **– Chemistry – Jason**

Synopsis of case: Jason took Chem 105 as part of his learning to become a PA. He quickly realized that the course topics did not align with what he thought a PA did professionally. There were several learning failures within the course that were never resolved and led to a change in major.	Case Findings: I. Jason tried to make logical sense of his learning failure experience, but was unable to except in superficial ways. II. Jason' learning failures went unresolved and ultimately led to a shift in his learning goals. III. Jason' learning failures were not complete failures, but some of the information was understood and retained. IV. Jason justifies his learning failures by pointing to the failures of others. V. Jason superficially blamed math for making chemistry incomprehensible. VI. Jason could not learn chemistry because the concepts did not relate well to his previous experiences or to his future professional aspirations. VII. Even after taking advantage of several resources, Jason failed to learn the foundational concepts of chemistry. VIII. Jason forgot some of his learning experiences, but some of the learning failures were vivid and unresolved, even after time had passed. His failures still bothered him. IX. As Jason went through his learning failure experiences in chemistry, he learned about himself, about his likes and dislikes. His learning failures disclosed self-knowledge and self-awareness. This new awareness led to the change in his professional pursuits. His telic self-projections were modified because of his learning failure experiences. X. Jason' learning failures in chemistry added evidence to his belief that he is
Uniqueness of case situation for phenomenon: Changing explanations of learning failures. Learning and life goals clearly modified because of the learning failure.	

<table>
<tr><td></td><td>not good with math. Learning failure experiences may confirm or challenge the beliefs we have about ourselves.
XI. Jason felt bad about getting a poor grade in chemistry, but he also felt frustrated about not being able to understand the course content. He never figured out what went wrong.
XII. Jason did not metacognitively evaluate his learning failures in chemistry.</td></tr>
<tr><td>Relevance of case for cross-case Themes:
Theme 1_____ Theme 2_____ Theme 3_____
Theme 4_____ Theme 5_____ Theme 6_____</td><td>Possible excerpts for cross-case report:
Page
Page
Page</td></tr>
<tr><td colspan="2">Factors (optional):

• What is the impact of questioning a student about their learning failures on the evolution their understanding of the failure?
• What is the impact of the learning failures of others on the way we feel about our own learning failures?
•</td></tr>
<tr><td colspan="2">Commentary:

This is a rich case, but it begs a fundamental question about university education:

Is the university education designed to prepare students for a vocation or to educate them with principles that have application to a broad variety of life experiences?

The answer is probably “both.” But instruction that prepares students for a career and for a broad spectrum of life experiences needs to be customized to the needs/interests of the student. This clearly didn’t happen for Jason in his Chem 105 class.

What if students had to identify their desired profession, or at least a set of desired professional activities and then were expected to relate course concepts to those professional activities throughout their program of study? I think this would help with motivation as well as keep the learning organized. Perhaps the career exploration courses at the beginning of the majors could do more to help students understand the different professions in the field along with their associated professional activities. Then when a student began the major, they had a better way of organizing the information as they learned it – almost like creating a learning outline/framework that would evolve as they learned more about their desired profession and the concepts covered in the course. I’m not sure how much work this would take or how much is already being done.

Why didn’t he understand the foundational stuff?</td></tr>
</table>

*** The learning failure was not complete. Some of the information was understood, even if it was not retained. The learning was clearly fragmentary. Is there a way to identify those fragments and to fill in the gaps later with the correct information?

*** Are all learning failures due to faulty logic? Is there such a thing as a logical learning failure?

He is bad with math. Is the math in chemistry really that complicated? What are the real reasons for the learning failures? He seems to be using popular excuses for failing to understand science. He is trying to justify his failures by appealing to popular experience with chemistry.

Was it the math, or was it that math had been troublesome in the past, so it was a ready excuse for the learning failures? What was so hard about the math? The info wasn't interesting, relevant to future goals, or simple (conceptually speaking). There are lots of other reasons why chemistry would have been difficult. Why math?

He never explains what was hard about understanding chemistry.

Why didn't the lecture info transfer to the labs? Why didn't the lab experience reinforce the learning of the lecture info?

The problem wasn't 'math', it was manipulating numbers and staying organized when working through a problem. Numbers = math for Jason. He didn't understand the concepts themselves, so he got confused when trying to work with them in any applied situation.

Lack of time. He didn't learn because he didn't put in the time. But besides time, what else prevented him from learning the foundational stuff?

Lack of motivation to learn chemistry. Why the lack of motivation? What does he mean by 'role'? Does a 'role' change the way a person learns?

Chemistry, even with all its learning failures, was a good experience. Why was it a 'good thing to go through'? Was it because it helped him become more self-aware of his preferences, his strengths and weaknesses, or his future career aspirations? I think so.

Because Jason mentioned grades and scores so much in the interviews, I believe that his end goal was to get a good grade in the class. He probably wanted to learn the concepts initially, but when it got hard, his goal shifted to just earning a good grade. When that didn't happen, his goal shifted to avoidance – "I don't ever want to deal with chemistry and math again."

What motivated Jason to start learning the information in the class? He went from being apathetic about the class information to very interested. What was his learning goal? Was it to learn to become a PA? To get good grades? To master the tough concepts he had failed at before?

Lack of logical reasoning may be one way that students like Jason identify their learning failures.

Learning failure

Jason' goal was to earn high grades on the tests and in the course as well as understand the course concepts. He failed to accomplish these goals and so he shifted them because his learning failures went unresolved. Jason modified his learning goals to match his learning preferences and his perception of his learning capacities.

> And I did really poorly on some of the tests and stuff. Then I thought, "Oh my goodness. I need to bring this back up," like the typical student, right? So I went back into it, but for the final I was just trying to pull a C, like a high C or whatever. But instead, I had been studying like I had these finals back to back, like I had that one week where you can choose when you're going to take it and stuff. And I thought, "Well, I can take it" – I don't know why I thought this, "I'll take the hardest one last. Chem 105." And so I burned myself out studying for those other classes. Some I did good on, some I didn't. Most I didn't do that hot on. It was like B's and high C's. I don't know. I don't know where the grade averages ended up at.
> So I felt like a D+ in it hit me pretty good.
> I was trying to study for the test but not really learning it. That's how it was I would say. I would say that's accurate in most cases in most classes actually.

Career application

Jason struggled to apply the course concepts to real life, specifically to future career activities. He didn't have an accurate concept of what his professional activities would be like. He had no role model or mentor helping him to make sense of the chemistry experience in relation to his goal to become a PA/PT. Jason had expectations of what a PA/PT does and the course concepts didn't relate well to those expected activities. This drove Jason to change his expectations of what a PA/PT does, which led him to conclude that he didn't want to do be one anymore.

> I wasn't putting myself in the role. But I think it goes to an even deeper issue. With school in general there are classes and things that you don't really want to take.
> I never had a desire to take Chem 105, but in my major at the time, exercise science, I had to take Chem 105. So when I think of exercise science, I think of working on people. I think of working with joints and looking at an injury and trying to treat it or trying to help someone. But I don't see or I never had a desire to get how the molecules work – like what happens to baking soda and vinegar when they come together and explode. I didn't see the relevance of that. When the teacher, Macedony, would come out with a cool fact about the human body or whatever, "and this is why this happens," then I could see through the veil so to speak – between chemistry and exercise science. I could see that there was an actual application there like why electrolytes are needed in the human body, "because the salt does this." There's an application there, you know? And so I kind of perked up a little bit.
> The only help I gave myself in getting through math courses at the college level is that if I found something that I loved enough – the idea of doing something in the future that would push me through all the crud. You know? And so I didn't feel like becoming a PT

> or some kind of doctor or someone in the medical field. I didn't feel excited enough about that to say, "Yeah. I'm going to go through this no matter what."
> But, I kind of wish I hadn't just switched out of the major just like that. But, at the same time I think it's a difficult thing because you don't know if there is actual application. I believe they must be having you take it for a reason. That's kind of in the back of your mind. Or, "is this what I'm doing for exercise science?." Honestly, there might be some application and stuff but, I thought about it more and concluded that I should have looked through the major more. It was a lot more involved in physics than I was originally expecting. It's just frustrating. I kind of don't regret changing out of the major.

Conceptual difficulty

Jason' failure to learn concepts early in the course led to greater difficulty with later concepts. One of the reasons Jason struggled with the concepts is that he could not see their application to his idea of real-world experience as a PA/PT. In general, Jason struggles conceptually with scientific ideas. He lacks an overall framework for understanding the ideas as they relate to one another and as they relate to the physical world. His understanding of scientific principles comes from trial and error and inconsistent feedback from peers and instructors. He would begin to understand a concept, but then a nuance or complexity was introduced and his entire understanding was destroyed. Jason couldn't understand the course concepts because it didn't fit within his understanding of what a PA/PT does. He didn't have previous experiences that gave him a foundation for understanding the basic principles of chemistry.

> I feel like it was because the beginning stuff was kind of foundational. There are actually two things. The beginning stuff was kind of foundational and so when I got into a little more advanced stuff it required that beginning stuff that I didn't really understand. I wasn't focusing on it as much and it kind of killed the rest because I hadn't taken the time to actually to relearn it.
> Because I didn't really understand the concepts of it, "how much of this stuff is part of this reaction," I didn't really know what I was talking about. The crossover from the knowledge and the stuff we were learning in class and getting my hands on it didn't really happen. Because if I didn't know the stuff from class I couldn't really answer the questions in the labs.
> The crossover from the knowledge and the stuff we were learning in class and getting my hands on it didn't really happen. Because if I didn't know the stuff from class I couldn't really answer the questions in the labs. And when I see any kind of chemical, like vinegar and baking soda, when I see those two go together, like bases and acids, I don't really think of it as "oh! This is this reaction happening to the molecules and stuff." I just don't think that. "It's getting foamy! It's going to explode!." I just don't think of it the other way. I see it just as a physical manifestation of something cool. I don't think of the theory behind it.
> And at the end I felt like I could kind of work with the moles, but not if we were going to add other subjects into working with the moles. But moles themselves, I feel I understood them at the time.
> Because with chemistry you work numbers in so many different ways. And throwing this element in or the type of reaction that you have going on changes up everything you do

about the problem. So for me it was really hard to adapt. I mean, it was coming at me so fast that I felt like I couldn't get how to work the numbers because I was always changing the numbers and how I worked with them.

With the idea of moles, it took some time to get used to doing the math with going between moles and other units and conversion. But at the end I felt like I was getting pretty adept at converting and understanding what a mole was and how a mole of one element and a mole of another element didn't necessarily mean that they were equal. I mean, I understood that they were the same. It was a mole, but it could be different in weight. It was just different amounts of the substance. So I just feel like over the course of the term I got good at it. But the thing is, since I didn't get it at the beginning when I needed to know it I didn't do so hot in the middle parts – in the other subjects when I still needed it. But by the end, it was enough trial and error and they explained it enough in class.

It was just keeping it straight in my mind that didn't work out and I wasn't patient enough to write it out, double-check it, or whatever.

With science, especially in the general science, there are so many weird rules. Science is just weird. Weird things happen - weird reactions, "When you add this element to this element you get this massive reaction" or whatever. "But when you add 'this' element to 'this' element it doesn't work the same as these two down here. It comes out to something completely different" and you're supposed to apply the math in a completely different way. And just that constant flux of rules and how you're supposed to deal with all these different things just kind of got to me I guess. That's why it happened so much.

Orbital shapes and energies was one of the topics that at first made a lot of sense to me, but I didn't know what they were for or what they were. So when I had to do something for a problem and I knew they were asking for what shape would they make, in the beginning I could get it but then in the long run I got confused again. I think it was in the more complex models or the more complex shapes where I thought, "I don't know what's going on here." When they were asking about this compound, this molecule, what shape it would make. I felt like if it was simple enough I could get it, but if wasn't I couldn't. What they would do is they would give you the formula and you would have to draw the picture and then "hmm. I've got that bond here. This is going to make this kind of structure." So if you got that right, you would usually know the shape and be able to get at least one of the names right, if you'd keep it straight. But, it was just getting the names straight on that one I feel like was the harder part of that.

Poor analysis

Jason was not able to properly analyze his learning failures; they remained a mystery to him. He could not understand why he failed to understand the course concepts. He remembered parts of the concepts but was unable to identify the ideas that didn't make sense to him. Sometimes he would think an idea was correct, only to find out his understanding was flawed. This unresolvable learning failure frustrated Jason. He failed to metacognitively evaluate the experience and identify his errors. His vague attempts to analyze his failures were never conclusive.

I just feel like it was something that was really easy that somehow got way too complex.

> If that's what it was, then I remember that if you were trying to find an energy level of the different elements and everything, the elements shoved together. Then you were trying to find what the final energy state would be. I could never figure that out. I never understood that one. I wasn't sure if it was supposed to be the energy levels added on top of each other or if they were subtracted from each other or if it was between the two energy levels or something. I just never understood the electron and its states.
> I would try to put some reasoning behind it but it was not anywhere close. I was really off. I went back and forth because that was where I felt a lot of the knowledge was really being drawn together.
> One thing I struggled with bonds was when you have these different elements coming together, these different compounds in a molecule and you're supposed to draw out the molecule. Somehow I'd always get a different drawn molecule than what they would put up, even though it had the same, what is it? Formula? It was specifically with nitrogen, like N-O-3 or something, nitrate. I would somehow write it out or I thought it had potassium in it or something. It was nitrogen, phosphate, or man! It was N and P in an equation or formula and I was supposed to draw out the molecule and what it would be. Somehow I would end up with the right amount of molecules and elements in the molecule and everything, but somehow I was wrong. Does that make sense? Even though it looked the same – it was the same – it was right by the numbers and letters. I never did understand why that was wrong – why this was wrong and this was right. At the time I felt like there was an easy difference. I really don't remember it though. I know that you write out like H-2-O and the other one. Actually, I don't think it was the actual molecule. I don't remember what it was, but it was something,
> for some reason I could just never come out right with it. I think I had problems with the conversion. I was still developing and working with the moles. So I got the conversions down and sometimes would get it right. Then other times I just thought "no, no, no." You could come out with the right answer but then you would name it wrong and then get it all wrong. So, you would know the shape, but not the name and that was frustrating. And I remember there were two separate ways to name. It was this kind of bond structure and this kind of molecular structure and you had similar names within the bond and the molecular structures. You could get so confused if it was tetrahedral over here but it wasn't a tetrahedral in the molecular structure over there. A linear and a linear – those are pretty easy molecules. And if you had two molecules and they were kind of linear and then you add a third out here that was a 45-degree angle, you were supposed to name that like a saw-bond structure. And then its molecular structure, it was linear, even though it wasn't. I don't know.

Teacher responsibility

Jason does not hold the teacher responsible for his learning failures. He says that his learning failure is due to his own shortcomings.

> He really cared about the education of students and he wasn't just throwing stuff out there trying to sound intelligent or anything. He is a great teacher and in the beginning he told us, "this is hard stuff. I'm not going to make it easy on you."

Self-awareness

Jason learns about his strengths and weaknesses, as well as his academic preferences because of his learning failure. He realizes that he does not enjoy chemistry or math.

> I like dealing with science conceptually. I think I deal better with the bigger picture than I do with technical specifics.
>
> I'm horrible at math. Math is my worst subject ever and Chem 105 was one of my first science classes where I had the science and the math kind of coming together.
>
> it wasn't just the Chem 105 itself, it was the fact that I didn't feel like I could push myself through the math. I didn't feel like I could.

Poor preparation

Jason does not feel as prepared as the other students in the course because he has forgotten what was covered in his high school chemistry class.

> And I hadn't done chemistry since high school – probably my junior year, I'm guessing.

Effort attribution

Jason cites lack of effort, rather than lack of ability for his learning failures. He believes he could have succeed in the course had he made the effort (i.e. put in the time). He didn't project that the effort to succeed would be worth the end result – work as a PA or other professional in the medical field. By attributing his failure to a lack of effort, he avoided the social shame that comes from a lack of ability. Jason was not interested in learning the course concepts because he didn't understand how it related to his desire to become a PA.

> At the beginning I did well then I kind of dropped off because I got focused on other classes and lost focus on Chemistry.
>
> But for Chem 105 I was totally burned out. And I just went into it in the testing center and just took it without studying. Worst idea ever!
>
> Macedony himself, tried to really put out opportunities for us. He didn't try to turn us down from seeing the professor and stuff and they need to be like that. But then there's the fact that students aren't really comfortable doing that or they don't feel like it's a high enough priority to go talk to them. I've just never really been one of those kids myself.

Learning strategies

Jason struggled to learn the course concepts because he struggled to know how to learn them. He attended lectures, labs, and recitations, and still he continued to experience learning failures. He guessed at the answers on the homework because he didn't understand the concepts. Jason stated that his goal was not retention of the course concepts. These poor learning strategies and motives contributed to his learning failure in the course.

> You come, you read, and you study. You read through it and it's not just a quick scan. You really read it. And then you have questions. Then you have two opportunities to really get out your questions: a lecture and your section recitations. In lecture you go over general problems to rehash what you've read in general terms. Then you go to recitations. I can't remember if homework was due before recitations or sometime afterwards. I think

> it was afterwards. I think you had until the next lecture, but I'm not sure. So in recitations the teacher went a little deeper into what you needed to know. He talked to you in student-to-student terms. So you could get your questions out and get it all pounded into you again. And then you were supposed to do the homework and know what you were doing when you got to the homework. But I used the homework like a lot of kids do. But I used the homework like a lot of kids do. I went through the homework and just bounced off the walls until I got in the right spot. And you had a certain number of tries for each problem. I don't remember how it worked, but if you didn't get it right the first time, you got a little point deduction and you would just get points deducted until they were forced to give you the right answer.
>
> I really started paying attention in class and reading when I could, and really trying to stay awake in recitations and learn how to do it right and take notes on it. I think a big thing was really just taking my own notes personally and looking back on those when I was doing my homework. Then I really started doing well on the homework. So that helped me a lot.
>
> The octet rule was one I remember it being simple in the beginning but then it got more complex. So when you are supposed to count how many electrons obviously you had more than eight, but I don't know. Maybe I would get so focused on a problem that I would forget there was this octet rule and I would miscount or not put down what was supposed to be there. I think because I didn't do well with the studying of it generally, that one part was ok but for the other parts, I just didn't really bother to try for retention. My retention was just really bad because I can't really remember it now.
>
> I don't have a chemistry book anymore because I had the online version. I don't know why I did that. It was handy I thought. There's really trade-offs between electronic and the physical copy. I probably should have done a physical copy because I think it would have been easier to look at something on the computer than look at the book. I think it could have been better sell back wise. That's usually what I think of now is sell back price. Sometimes I would read the book and sometimes I wouldn't. It was weird.
>
> I think I'm getting topics mixed up here too. I definitely did not try to retain this stuff. I just kind of mashed into my brain to the point where I could say, "Okay, this is what I'm supposed to do here" and then build up to the next problem, the next kind of idea. There was that. I also remember specifically in Chem 105 there was a lot of memorization, like elements and formulas and all that stuff. And in memorizing that stuff, I didn't really focus on that until the very last moment and I didn't really get it.

Social anxiety

Jason' fear of social embarrassment kept him from asking questions and getting help in class. He tried to resolve his learning failures by watching what other students did. He didn't feel confident in any of his own answers. He justified his learning failures because of other students' failures in the course.

> But in the big lecture class, I was going to make sure that my questions had some punch – that they were good questions. I wasn't going to be throwing out any dumb ones and have everyone or the teacher make fun of me at my expense. The teacher would joke around and stuff, but I didn't even ask a question, I don't think. I don't know.

> the TA would have a student go up and they would work out the problem in front of you. So there were a lot of smart kids in the class who were really on top of it and once they went through it, I could kind of see where I went off from them or when I did the same thing as them and tried to get the right answer.
> everybody just didn't do well at it. I know I wasn't the only one in class that wasn't doing so hot at it because we had several people that had to go up and do the scientific notation for these huge numbers and we got them wrong fairly consistently. Then the TA would explain and we thought "oh!." And then the next class period, I remember Macedony was saying, "This gets a lot of people." I remember him saying that and it really does. It got me plenty of times and it got everybody else too –
> She changed majors because of the class too. She had the same exact experience that I did – same teacher. She was in the same section, the same group. She was in my section and when we started talking about it, we were right on with each other. We knew exactly what each other were talking about. I think a big part of it was that we both didn't put in the time when it was really necessary to get the basic fundamental things down the beginning. One thing that was different between us is that she said she pretty much didn't understand what was going on the whole time. I think that's pretty common. There are males and females – this may or may not be true, but I feel like guys think, "I understand this, but I don't understand this." It's pretty cut and dry. But in conversation, a lot of girls say, "I had no clue about a single thing that was going on." They kind of look at the big picture and say, "none of that made sense." And so that was one thing that was different. But, she kind of evened out and did better than I did in the class because she studied for the final and she did the small things and did the homework and double-checked. We had the same level of patience and we always ended up with similar answers, but we didn't understand why they were right or wrong. Does that make sense? And we were so confused or we were just so frustrated or just the combination of all of the feelings that we were feeling that we made changes to our life's direction because of the feelings that came up – that frustration and lack of knowing what was up, that lack of knowledge.

Course structure

Jason had difficulty with the course structure not allowing for "learning by guessing." He struggled with the course concepts and the course assignments reinforced those difficulties. The homework didn't help him much either.

> In my Chem 105 class, the teacher created a system where you were doing your own work and you had an opportunity to learn and get some things wrong sometimes. But, you weren't going to get the right answer, for the most part, if you didn't know what was going on in the problem. And usually you had lots of choices on Chem 105 tests, like A through J. So it was like this drawing of the potassium pump again. It was a drawing of these two lines going across and you have this tube thing and this molecule thing going in and out of it. And I'm thinking, "how?."
> The homework was good, the online stuff. It was a good program. Once I really started putting my head to it, I picked up more out of the homework than anything else.

Stake multi-case analysis worksheet #3 – Jason – ASL course

Worksheet 3. Analyst's notes while reading a case report

Case ID**: ASL – Jason**

<table>
<tr><td>Synopsis of case:

Jason was trying to learn ASL so that he could communicate with the deaf, particularly a boy named Kenny that he met in Micronesia. Even though he earned a good grade in the class, Jason failed to learn the grammar of ASL, which left him feeling insecure about his ability to communicate in sign language.</td><td rowspan="2">Case Findings:
I. Even though he got a good grade in the class, Jason still experienced learning failure when it came to ASL grammar.
II. His past failures to communicate with Kenny seemed to motivate Jason to learn ASL.
III. Jason initial motivation was not enough for him to persist and learn ASL grammar.
IV. Jason cited the experiences of others to justify his decision to not pursue ASL classes in the future.
V. Jason' learning failure with ASL grammar was associated with public embarrassment because he felt his task performance was poor.</td></tr>
<tr><td>Uniqueness of case situation for phenomenon:

This was a case where Jason earned a high grade in the course, but still felt he had failed to accomplish his goal to learn ASL grammar.</td></tr>
<tr><td>Relevance of case for cross-case Themes:
See below</td><td>Possible excerpts for cross-case report:
Refer to corresponding Comments page</td></tr>
<tr><td colspan="2">Factors (optional):
• Impact of public performance evaluation on the identification of learning failure
• impact of social collusion on learning failure attributions</td></tr>
<tr><td colspan="2">Commentary:

This is a good case because the learning failure was clearly defined as Jason' failure to learn ASL grammar. It is also a good negative case for two reasons: 1) It demonstrates the motivating effects of past failures and 2) It demonstrates how learning failure and good grades are not mutually exclusive.

*** What does he actually enjoy about sign language? This experience seemed like somewhat of a failure. Perhaps he enjoyed learning about the use of facial expressions and improvising signs that he mentions later.
Not being able to use the skills from the ASL course sounds like a disappointment. This could affect his motivation to learn more and to persist through his learning failures. This is a good example of the telic nature of motivation and its relation to expected value of learning. When the expected value isn't present, motivation to persist through learning failures diminishes.
Initial motivation to learn ASL was to talk to Kenny. That motivation is weak because the object of the motivation is removed both temporally and geographically.</td></tr>
</table>

Jason is willing to compromise his goal because of his learning failure. He has revised his learning goal in light of the effort he perceives it will take him to master ASL grammar versus the expected benefit he would experience if he made the effort.
*** It is interesting that Jason' learning failure in the course led him to avoid future ASL courses and that he seems not to value what he did learn in the course. Perhaps the value he placed on learning ASL to be able to talk to Kenny shifted when he failed to learn the grammar as he expected.
*** There is power in the relation of new ideas to old ones. It makes assimilation of the new concept easier for the student.

Learning Failure

Jason wanted to learn ASL grammar in this course, but he failed to do so. Even though he earned a high grade in the course, this still stood out to him as a learning failure.

> But the ASL grammar thing, when we had to get up in front of the class and sign something – we had to do a children's book. It's pretty standard for the ASL 101 classes. And I'll tell you what – I sure felt the not-knowing-the-grammar on that. Even though the teacher passed me with an A-, I thought, "what am I doing?."
> So, I really liked ASL, I felt like there was a good reason for me to be in it. I learned it. I don't regret taking that class at all. It was kind of different from my Chem 105 experience, but I would still say that I failed to learn the grammar there.
> Now I can actually say, "hi. How are you – Good," you know? Even though I won't be able to talk to him about these complex ideas, we'll still be able to communicate at least

Social anxiety

Jason recalls feeling embarrassed by his lack of ASL skill when he was asked to sign in front of his peers.

> I was just throwing out signs that I knew because I was scared and I was freaking out. And so, I think it just stands out because it was a more socially embarrassing situation for me.

Social justification

Jason justifies his learning failures by citing the learning failures of his peers in the course.

> I've talked to a lot of girls in the class and they kind of did the same thing as me. We were all excited to get into it and then we all got kind of tired of it and we just kind of left off

Conceptual difficulty

Jason struggled to understand the concepts of ASL grammar. He expected it to be like English grammar, but when it was not, he struggled to accommodate the new ideas in his way of thinking.

> We don't really hate it or dislike it, but we were thinking, "I'm not sure I want to go through three more classes of this." And the grammar of sign language didn't really click

> with me, even though the teacher explained it. I still treat the grammar like it's English grammar, which is not right. So, I never really knew if I was doing it wrong or not.

Instructor conflict

Jason' lost confidence in the instructor when the feedback he received was inconsistent. This lack of consistent feedback added to his confusion about ASL grammar and contributed to his learning failure.

> They'll see the context of what you're trying to say with your signs and try to put it together. Sometimes it doesn't work, but sometimes it does. So, the teacher knew sign language and I think she knew what I was trying to say most of the time. She did correct me and stuff but I feel like it wasn't consistent.

Past experience

Jason draws on past experience to describe his motives for taking the ASL course and as a basis for understanding the course concepts. His past experiences continued to frustrate him enough that he wanted to learn ASL. His past experiences also created expectations for the ASL class and the learning experiences he would have. Jason expected to learn ASL grammar in the course and when he failed to learn it, he felt even more frustrated.

> And I was so frustrated that I couldn't talk to him. It was kind of funny because we always thought, "oh, we don't know sign language" and he didn't really know sign language. He knew basic stuff.
>
> We were just trying to explain the first sentence and the second sentence. "God is our loving Heavenly Father. He knows you Kenny!" and it frustrated the heck out of me because I was used to thinking, "okay! We're going to do the first lesson here and the second lesson" and of course you're supposed to try and apply it to the person and stuff. I understand that to a degree, but I'd never seen anybody where they wanted to learn it, but had to go through the lessons so slowly. So, I came back here and I thought, "I want to learn ASL" so that one day I'll be able to go back and say, "Hi. My name is Jason" and just do all that stuff.

Minimizing failure

Jason tried to explain how his learning failure in the class probably won't affect his future too much, but his disappointment with not being more skilled in ASL communication is evident.

> I haven't really run into very many deaf people either and I feel that with Kenny back in Pompeii, I could see that I at least wanted to be able to learn it so I could talk to him. I don't know, I think that's part of it, that now I can actually say, "hi. How are you – Good," you know? Even though I won't be able to talk to him about these complex ideas, we'll still be able to communicate at least. At least now I understand that I have to do facial expressions with a sign and I can still talk to him by mouthing it, shouting it, I don't know.
>
> He sees what I'm doing and you can make up stuff when you sign, you can improvise a little bit. So, I don't think the grammar is really going to matter there. That's not what I

was thinking when I decided I wasn't going to do ASL anymore. I was just thinking, "well, ASL is still cool, but I'm not as excited about it as I was."

Stake multi-case analysis worksheet #4 – Amy – Cross-case

Amy - Worksheet 4. Estimates of Ordinariness of the Situation of Each Case and Estimates of Manifestation of Multicase Themes in Each Case

W = highly unusual situation, u = somewhat unusual situation, blank = ordinary situation
M = high manifestation, m = some manifestation, blank = almost no manifestation

	Chemistry	Statistics
Ordinariness of this Case's situation:	W	W
Original Multicase Themes		
1. Learning failure	1 WM	1 WM
2. Social dynamics		7 um
3. Self-doubt, Confidence issues	2 WM	6 um
4. Instructional strategies	4 um	
5. Conceptual framework, Hard concepts	7 uM	2 WM
6. Learning strategies, Study strategies	3 um	3 um
7. Social anxiety	5 WM	
8. Effort attribution	6 WM	
9. Analyzing problems		3 WM
10. Time management		5 WM
11. Remediation		8 WM
Added Multicase Themes		
12. Social dependence	WM	WM
13. Vague goals	WM	WM

High manifestation means that the Theme is prominent in this particular case study.

A highly unusual situation (far from ordinary) is one that is expected to challenge the generality of themes.

As indicated, the original themes can be augmented by additional themes even as late as the beginning of the cross-case analysis. The paragraphs on each Theme should be attached to the matrix so that the basis for estimates can be readily examined.

Multicase Themes

Learning failure

(Chemistry) Amy's original goal was to earn a high grade in the course. After here initial learning failure, her new goal was to avoid failing the course. She also wanted to understand the explanations of the instructor. She struggled to work through the "confusion" associated with the course concepts until they were no longer confusing. She wanted to master the course concepts, but failed to invest the time necessary to master them.

> Chemistry I learned was something that didn't come easily to me. So I tried it a few different times.

I would start the course and then realized it was going to be too hard for my schedule and then drop it just before the add/drop deadline or the withdrawal deadline. So that was the first couple times I tried to start Chem 105. But then the third time I took it and kept through it and I didn't fail it.

So that was good, but I didn't do amazing. I think that's part of me being a perfectionist and then using perfectionism as a way of procrastination and then just not doing something.

I think conceptually, trying to understand some of the things the teacher taught and trying to figure it out in my mind was difficult.

It was confusing and it took a lot of work for me to realize what the polarity would be

I don't think I ever felt like I had mastered it.

But I definitely could have if I had put in the time and the hard work and everything for it.

I remember learning about them.

(Statistics) Amy wanted to get an A grade in the course the first time that she took it but she quit because she couldn't understand the concepts and she did poorly on the homework.

I've seen this with myself whenever I do something that proves to be difficult for me, I hit this wall and I say, "oh! I don't want to try this anymore!" And that's when I drop the class the first time.

I just couldn't quite understand the concepts. So I if I did do the homework I did poorly on the homework.

So, when it clicked I could stay awake. The second time I took Stats 121 it just clicked and I got an A. It's just the basic stuff.

The first time it was like I just didn't get it and it all went over my head. There were proportions and trying to understand definitions. Because in stats it's not as much math as it is understanding definitions.

Social dynamics

(Statistics) Amy's stronger relationships the second time she took the course contributed to her success. She persisted when she had others encouraging her to work through her learning failures.

Then there are other people there that say, "Come on! You've got to keep doing it!" or I have to take the class and so I have to learn it at some point and I keep forcing myself.

The second time I went through stats, I had a different teacher and different TA's. And that's another thing. I loved the TA that I had the second time. The first time he was a little confusing. The second time I think she was a lot more experienced. So she would watch our faces and when she could tell that we were still confused she would explain it in a different way, "what about this? Okay, what about this?." And so that was another nice thing – that she was willing to review it again and again until she could tell that we were understanding it. Like when the light came to our eyes. That was really helpful – TA's that I could talk to. Plus, I was in a tiny class (the second time) that only consisted of three or four students. It was a special situation where we were on a stats portal for homework assignments as opposed to this "my-stats-lab-homework-thing" program that they were testing out with everyone else.

Self-doubt, confidence issues

(Chemistry) Amy remembered the feelings of self-doubt created by her poor testing experiences in this course. She learned from her learning failure that she wasn't as strong a learner as she thought she was. Her learning failure led her to doubt her ability to learn in other courses at the university. This self-doubt negatively impacted her engagement in the course. However, once Amy understood a concept, she had really positive feelings about the learning success, which counteracted some of the self-doubt.

> Chemistry I learned was something that didn't come easily to me
> With chemistry early on I remember the feeling that I had coming out of the testing center late at night, doing as much as I could, being kicked out of the testing center because it was closing, trying to fill in random bubbles and just the feeling of walking through campus thinking, "I shouldn't be here. I cannot do this. I'm not as good of a student as BYU deserves or as BYU requires."
> the feeling that I had coming out of the testing center late at night, doing as much as I could, being kicked out of the testing center because it was closing, trying to fill in random bubbles and just the feeling of walking through campus thinking, "I shouldn't be here. I cannot do this. I'm not as good of a student as BYU deserves or as BYU requires."
> That's the one that I think I'm a little ashamed about it. Just because I started it maybe even a couple of times and the third time I kept through it and still did not do very well. And I think in the beginning, the first time I started it I already started out being nervous about it because people told me it was a hard class. And for me, I already had this perspective of myself that "I'm not a very good student. I don't do well in hard classes" and that's what was going on. A part of it I think was that when something looked hard, I didn't feel like working on it because I knew I would fail in a sense. Or I knew I wouldn't be able to do as well as I wanted to and so it would be hard to get the motivation to actually do the homework.
> That's the one that I think I'm a little ashamed about it. Just because I started it maybe even a couple of times and the third time I kept through it and still did not do very well. And I think in the beginning, the first time I started it I already started out being nervous about it because people told me it was a hard class. And for me, I already had this perspective of myself that "I'm not a very good student. I don't do well in hard classes" and that's what was going on. A part of it I think was that when something looked hard, I didn't feel like working on it because I knew I would fail in a sense. Or I knew I wouldn't be able to do as well as I wanted to and so it would be hard to get the motivation to actually do the homework.
> But I remember that those details sometimes intimidated me too. Because for me, I see something and I think "that's too hard for me" – that's that initial thought. And then sometimes I don't want to learn the details – I don't bother to learn the details because I think, "that's beyond me."
> Whenever I did finally understand it, it felt really good.

(Statistics) Amy was not confident in her ability to understand the course content. She built her confidence by relying on help from siblings who had already successfully taken statistics.

> It definitely wasn't a big confidence feeling going into that class. But, I did think, "Well, I do have to take this class for this or that, so we'll just see how it goes." I had an older

> sister that took statistics and she liked it. But, that was in high school, so it was probably really simplified. And I thought, "well, I've got family who understands statistics. And I have an older brother who did a lot too. So, maybe it will work out."

Instructional strategy

(Chemistry) Amy remembered the good instructional strategies related to learning about dimensional analysis. The instructional strategies for other topics were not as helpful.

> If it's anything like I remember, the teacher had this really good visual aid for understanding dimensions of different things. He had balloons that he would use to show that when you tighten the strings on any of these balloons they'll automatically go into a certain formation and that's how this kind of molecule would be. When you take off one part of the molecule then the balloons automatically shift and go into another type of dimension. It's like you pop a balloon and the balloons, you shake them and they automatically shifted to a new position and you would see the little formation they made. He said, "this is how it would be like this" and then he would continuously pop a balloon. I remember that was a really good way to finally figure it out. I had to really see it.

Conceptual framework, Hard concepts

(Chemistry) Amy expected that the course concepts would follow predictable laws that would make sense within a framework. The apparent lack of "predictability" of the course concepts made her learning failure worse. She believed that there was a "right" way to understand the course concepts that continuously eluded her. She felt that the course concepts did not relate to anything that she was familiar with and so she struggled to reform her ways of thinking to accommodate the new ideas. Amy had the beginnings of a conceptual framework for the course concepts because of previous experiences, but her framework was not sufficient to tie together all the concepts in a coherent way. She came away from the course "less confused" instead of "understanding" the course concepts.

> I think conceptually, trying to understand some of the things the teacher taught and trying to figure it out in my mind was difficult. And sometimes books have different kinds of diagrams in them to try to explain one principle. For me when I have a lot of different diagrams it confuses me as opposed to if it just had one diagram that it would keep teaching from. I think they're all about something different and I can't picture it in my mind. Then trying to memorize all of the little molecules and then how you put them all together was hard for me.
>
> I think things got hard when he started to get into the basics of organic chemistry. Just trying to understand what the basic molecules were and how they would fit together, how that would change the polarity of the molecule and trying to understand what direction it would go in, etc. was hard. Because somehow when they combined, the shape of the molecule changed. Sometimes that was confusing to me, unless I had the little things that people put together. I never really played with those.
>
> It just seemed like there were so many little details that would cause it to act in a certain way that it wasn't as easy in my mind as a 1 + 1 = 2 sort of thing.

> It bothered me that it didn't fit with any other form of measurement that I had known before and that it was its own thing. You had to learn that from scratch again. You couldn't relate it to things as much.
>
> I guess maybe I kept feeling like it was unpredictable.
>
> I guess maybe I kept feeling like it was unpredictable. That's how it seemed. But I think what the teacher was probably trying to explain was that it is predictable and that there is a certain pattern – you just have to get it down. That was probably it. I couldn't really figure it out.
>
> I think I remember the initial struggle of learning it and then it did eventually come but I don't think I ever felt like I had mastered it. So, there were some stages in between where I thought, "I can kind of understand this" because of my base with other things.
>
> I recognize all these names. I'm trying to remember the homework assignments. If I could just look through the book and flip through the pages I would be able to remember, "that was good" because I had been through that book – not completely because the chemistry book is like one hundred pounds.

(Statistics) Amy failed to understand the definitions of the course concepts because they did not relate to her past experience with math and other concepts that she thought should be related. She was confused by the difference between BYU definitions and definitions that she came across on the internet. She also struggled to understand how the course concepts applied to real life.

> I think part of it's hard because the concepts are hard. Statistical things aren't always easy for people to understand. I think there's a lot of trying to understand these statistical procedures and how they apply to a real life setting. I think that's part of it.
>
> I think the hard thing the first time I went through the stats class is that the BYU stats particularly has its own kind of language for stats as opposed to the rest of the world. So they have their own terms I think that they use for certain things. And sometimes I would just randomly search for things on Wikipedia and it would be slightly different. I realized that I had to forget Wikipedia and studying things on my own and just focus on the BYU stats. I noticed that BYU has its own stats terms and that's one thing – learning the terms for certain things.

Learning strategies, Study strategies

(Chemistry) Amy consistently showed up late for class, which contributed to her learning failure.

> And I would always be late. That was another bad thing on my part. I was always late, so I would always be sitting on the stairs along the sides. And I wasn't the only one. There was always a ton of students. So, being a little person over on the side of the stairs that walked in late, I would feel even worse about asking the teacher a question and making him go back.

(Statistics) Amy was able to resolve her learning failure by improving her study strategies.

> So I learned more how to write all over my formula sheet and my book and my notes and just be willing to make a mess out of it. But the more I write, the easier it comes to me. Or if I draw things – I have to be actively doing something with my hand. So rather than just typing out notes, I have a notebook. And actually, when I was a training to be a TA, I would go back and review my notes from when I was a student, and that would help me figure out how to teach it better. I think I combined in the same notebook my notes from

> the first time I took stats and the second time. So the first time, I would be falling asleep and it was so sad and then the second time I would have really good notes.

Social anxiety

(Chemistry) Amy's learning failure happened because she did not ask for the help she needed. She didn't want to inconvenience the professor or the other students because she perceived that she was the only one struggling with the concepts. She also felt underprepared for the course because she did not take a chemistry class in high school like many of the other students. Amy felt inferior to the others in the course because of her learning failure and because of her perceptions of the relative successes of other students. She also felt that the large size of the course and the poor seating arrangements contributed to her learning failure.

> Chem 105 is a huge class! And so there were multiple days when it's in one of those rooms that have the big stadium seating and it's got, probably 100 or at least 80 students in our class. And so all the seats would kind of fill up on the outsides and you wouldn't want to climb over a ton of people.
> Chem 105 is a huge class! And so there were multiple days when it's in one of those rooms that have the big stadium seating and it's got, probably 100 or at least 80 students in our class. And so all the seats would kind of fill up on the outsides and you wouldn't want to climb over a ton of people.
> I would feel even worse about asking the teacher a question and making him go back. I was sitting in class listening intently and I still didn't understand it. I needed the teacher to go back to the very beginning and re-explain it in a different way. But all the students around me looked like they understood it. They were all asking these questions that apply to it and I felt like I wouldn't even know how to ask a question because I just didn't understand it. I would be in class and the teacher would just lose me in the beginning but then he would just keep going and I wouldn't want to make him go back. So many students looked like they were perfectly smart and I always had this bad perspective of myself where I felt like I was the only one who didn't understand and everyone's going to think I'm stupid if I make the teacher go all the way back.
> So, being a little person over on the side of the stairs that walked in late, I would feel even worse about asking the teacher a question and making him go back. I was sitting in class listening intently and I still didn't understand it. I needed the teacher to go back to the very beginning and re-explain it in a different way. But all the students around me looked like they understood it. They were all asking these questions that apply to it and I felt like I wouldn't even know how to ask a question because I just didn't understand it. I would be in class and the teacher would just lose me in the beginning but then he would just keep going and I wouldn't want to make him go back. So many students looked like they were perfectly smart and I always had this bad perspective of myself where I felt like I was the only one who didn't understand and everyone's going to think I'm stupid if I make the teacher go all the way back.
> And I think because of that perspective I had in the beginning it already made me not want to really study which would have been the thing that would've helped me. If I had felt comfortable enough to go to the teacher and say, "I don't understand this. Can I meet with you?" Then, I would've been so much better! But, I just wasn't confident like that at all.

> And I think because of that perspective I had in the beginning it already made me not want to really study which would have been the thing that would've helped me. If I had felt comfortable enough to go to the teacher and say, "I don't understand this. Can I meet with you?" Then, I would've been so much better! But, I just wasn't confident like that at all.
> I've talked to other people about this. I would tell them "This is my first chemistry class in college" and they would say, "Wait. You didn't take it in high school?" And I would say, "Well, I did physics in high school." At my high school you could take one or the other for that requirement.
> I've talked to other people about this. I would tell them "This is my first chemistry class in college" and they would say, "Wait. You didn't take it in high school?" And I would say, "Well, I did physics in high school." At my high school you could take one or the other for that requirement. Chemistry was just a little more conceptually harder to understand for me.
> The second time I got it a little bit better. I think it took the TA helping me. I would go to lab even if I felt ridiculous asking again and making the TA explain it in a different way and actually reading every word in the book and not just skimming. So that's when I finally tried to get over my pride issues – having to ask yet again because I still didn't get it {…} But I think it was really just applying myself and having it explained to me in different ways and then reading it again from the book. I remember I had to have it explained and then I would say it back. If I said it wrong they would say "no, no, no" then they would explain it again in the same way. As long as I said it back in the right way, that's when I thought "okay, I think I understand." The interaction helped a lot. And even if someone explained it again the third time, finally the first one clicked. For me it's just going through the grueling process of talking about it again and again and again and then finally I can understand it.

Effort attribution

(Chemistry) Amy's tried to learn the course concepts on her own, but what she needed was help from someone else. She expected to understand the course concepts easily and when she didn't, she attributed the learning failure to a lack of effort. She felt like she wasn't putting enough time into the course. Amy thought that she could just "keep going," putting more effort into the course even though she was not learning the concepts.

> Eventually I realized that "I'm just going to keep going and it doesn't matter what people do or think or what they understand. I'm just going to make sure I can keep understanding this." So I think that I barely got by with the homework assignments because it was still just harder for me to understand.
> It could also be that I just didn't put in the time that it needed.
> It just didn't come very easily to me. It could also be that I just didn't put in the time that it needed.
> But once you got it down, everything else built on it. So you had to get that down. And I remember the first time I took chemistry, trying to understand moles didn't quite click, but I thought I would just keep going. And I couldn't really understand it – the whole concept of moles in the beginning.

Analyzing problems

(Statistics) Amy's lack of ability to analyze and understand the assignment problems contributed to her learning failure.

> I think part of it was just trying to organize it all in my mind. Because there's a bunch of different formulas for different situations and so it was trying to read the situation and understand which formula applied. That was something that I just could not figure out how to organize in my mind. And now I can read a problem and think "oh yeah! I need this formula or that formula."

Time management

(Statistics) Amy struggled to manage her time across her classes, which contributed to her learning failure. When she put in the time to go to the labs she was able to learn the material.

> I think I hesitated and probably waited to do the homework for it until last. And then I ended up not always being able to always do it because it was harder homework. So, I got done what I could.
>
> Other parts of it was just making sure I had time in my schedule and forcing myself to go to the lab. And not just the scheduled lab that you sign up for that you have to go to get a grade for, but also the open lab. And I had to make sure that I went to that even if I didn't want to and that I needed to even if I didn't want to.

Remediation

(Statistics) Amy was able to resolve her learning failure the second time she took statistics because she was able to fill in the gaps in her understanding. Resolving her learning failure led Amy to pursue additional opportunities for learning statistics.

> So with that base of hearing it the first time and kind of starting and then hearing it again from someone else's mouth a different way, I thought "oh, that totally makes sense."
>
> It was like Stats was just wonderful. I actually went through a couple of semesters of training to be a TA for Stats. And then I realized I couldn't fit it into my schedule, which is sad because I did training to become a stats TA. But I wasn't actually a Stats TA. So, now I like stats because I understand it.
>
> So, now I like stats because I understand it.

Social dependence

Amy relied heavily on her relationships with other students to learn course concepts, to accomplish assignments, and to morally support her during her experiences. When these social relationships were strong and supportive, Amy thrived. When they were absent, she struggled.

Vague goals

Amy's lack of clear goals for her life greatly contributed to her learning failures. She struggled to understand course concepts because they did not relate to career goals or her previous experiences. Additionally, she struggled to relate well to instructors and students in courses that she was not interested in, which made it difficult for her to learn the concepts (see Social

dependence theme). Her poor performance led to her lack of confidence in her career goals, her learning strategies, and in her own capacity to succeed as a student. Once Amy established clear goals for herself, she began to experience success either through overcoming her learning failures or establishing new learning goals.

Stake multi-case analysis worksheet #4 – Jason – Cross-case

Jason - Worksheet 4. Estimates of Ordinariness of the Situation of Each Case and Estimates of Manifestation of Multicase Themes in Each Case

W = highly unusual situation, u = somewhat unusual situation, blank = ordinary situation
M = high manifestation, m = some manifestation, blank = almost no manifestation

	Chemistry	ASL
Ordinariness of this Case's situation:	W	W
Original Multicase Themes		
1. Learning failure	1 WM	1 WM
2. Conceptual difficulty	3WM	4uM
3. Career application, Career activities	2uM	
4. Effort attribution	8um	
5. Social anxiety	10um	2Wm
6. Course structure	11um	
7. Poor analysis	4 WM	
8. Teacher responsibility	5Wm	
9. Self-awareness	6 Wm	
10. Poor preparation	7 Wm	
11. Learning strategies	9 Wm	
12. Social justification		3 WM
13. Instructor conflict		5Wm
14. Past experience		6 WM
15. Minimizing failure		7 WM
Added Multicase Themes		
16. Failure reactions	WM	WM
17. Instructor expectations	Wm	Wm
18. Social difficulties	Wm	WM

High manifestation means that the Theme is prominent in this particular case study.

A highly unusual situation (far from ordinary) is one that is expected to challenge the generality of themes.

As indicated, the original themes can be augmented by additional themes even as late as the beginning of the cross-case analysis. The paragraphs on each Theme should be attached to the matrix so that the basis for estimates can be readily examined.

Multicase Themes

Learning failure

(Chemistry) Jason' goal was to earn high grades on the tests and in the course as well as understand the course concepts. He failed to accomplish these goals and so he shifted them because his learning failures went unresolved. Jason modified his learning goals to match his learning preferences and his perception of his learning capacities.

> And I did really poorly on some of the tests and stuff. Then I thought, "Oh my goodness. I need to bring this back up," like the typical student, right? So I went back into it, but for the final I was just trying to pull a C, like a high C or whatever. But instead, I had been studying like I had these finals back to back, like I had that one week where you can choose when you're going to take it and stuff. And I thought, "Well, I can take it" – I don't know why I thought this, "I'll take the hardest one last. Chem 105." And so I burned myself out studying for those other classes. Some I did good on, some I didn't. Most I didn't do that hot on. It was like B's and high C's. I don't know. I don't know where the grade averages ended up at.
>
> So I felt like a D+ in it hit me pretty good.
>
> I was trying to study for the test but not really learning it. That's how it was I would say. I would say that's accurate in most cases in most classes actually.

(ASL) Jason wanted to learn ASL grammar in this course, but he failed to do so. Even though he earned a high grade in the course, this still stood out to him as a learning failure.

> But the ASL grammar thing, when we had to get up in front of the class and sign something – we had to do a children's book. It's pretty standard for the ASL 101 classes. And I'll tell you what – I sure felt the not-knowing-the-grammar on that. Even though the teacher passed me with an A-, I thought, "what am I doing?."
>
> So, I really liked ASL, I felt like there was a good reason for me to be in it. I learned it. I don't regret taking that class at all. It was kind of different from my Chem 105 experience, but I would still say that I failed to learn the grammar there.
>
> Now I can actually say, "hi. How are you – Good," you know? Even though I won't be able to talk to him about these complex ideas, we'll still be able to communicate at least

Conceptual difficulty

(Chemistry) Jason' failure to learn concepts early in the course led to greater difficulty with later concepts. One of the reasons Jason struggled with the concepts is that he could not see their application to his idea of real-world experience as a PA/PT. In general, Jason struggles conceptually with scientific ideas. He lacks an overall framework for understanding the ideas as they relate to one another and as they relate to the physical world. His understanding of scientific principles comes from trial and error and inconsistent feedback from peers and instructors. He would begin to understand a concept, but then a nuance or complexity was introduced and his entire understanding was destroyed. Jason couldn't understand the course concepts because it didn't fit within his understanding of what a PA/PT does. He didn't have previous experiences that gave him a foundation for understanding the basic principles of chemistry.

> I feel like it was because the beginning stuff was kind of foundational. There are actually two things. The beginning stuff was kind of foundational and so when I got into a little more advanced stuff it required that beginning stuff that I didn't really understand. I wasn't focusing on it as much and it kind of killed the rest because I hadn't taken the time to actually to relearn it.
>
> Because I didn't really understand the concepts of it, "how much of this stuff is part of this reaction," I didn't really know what I was talking about. The crossover from the knowledge and the stuff we were learning in class and getting my hands on it didn't really happen. Because if I didn't know the stuff from class I couldn't really answer the questions in the labs.

The crossover from the knowledge and the stuff we were learning in class and getting my hands on it didn't really happen. Because if I didn't know the stuff from class I couldn't really answer the questions in the labs. And when I see any kind of chemical, like vinegar and baking soda, when I see those two go together, like bases and acids, I don't really think of it as "oh! This is this reaction happening to the molecules and stuff." I just don't think that. "It's getting foamy! It's going to explode!." I just don't think of it the other way. I see it just as a physical manifestation of something cool. I don't think of the theory behind it.

And at the end I felt like I could kind of work with the moles, but not if we were going to add other subjects into working with the moles. But moles themselves, I feel I understood them at the time.

Because with chemistry you work numbers in so many different ways. And throwing this element in or the type of reaction that you have going on changes up everything you do about the problem. So for me it was really hard to adapt. I mean, it was coming at me so fast that I felt like I couldn't get how to work the numbers because I was always changing the numbers and how I worked with them.

With the idea of moles, it took some time to get used to doing the math with going between moles and other units and conversion. But at the end I felt like I was getting pretty adept at converting and understanding what a mole was and how a mole of one element and a mole of another element didn't necessarily mean that they were equal. I mean, I understood that they were the same. It was a mole, but it could be different in weight. It was just different amounts of the substance. So I just feel like over the course of the term I got good at it. But the thing is, since I didn't get it at the beginning when I needed to know it I didn't do so hot in the middle parts – in the other subjects when I still needed it. But by the end, it was enough trial and error and they explained it enough in class.

It was just keeping it straight in my mind that didn't work out and I wasn't patient enough to write it out, double-check it, or whatever.

With science, especially in the general science, there are so many weird rules. Science is just weird. Weird things happen - weird reactions, "When you add this element to this element you get this massive reaction" or whatever. "But when you add 'this' element to 'this' element it doesn't work the same as these two down here. It comes out to something completely different" and you're supposed to apply the math in a completely different way. And just that constant flux of rules and how you're supposed to deal with all these different things just kind of got to me I guess. That's why it happened so much.

Orbital shapes and energies was one of the topics that at first made a lot of sense to me, but I didn't know what they were for or what they were. So when I had to do something for a problem and I knew they were asking for what shape would they make, in the beginning I could get it but then in the long run I got confused again. I think it was in the more complex models or the more complex shapes where I thought, "I don't know what's going on here." When they were asking about this compound, this molecule, what shape it would make. I felt like if it was simple enough I could get it, but if wasn't I couldn't. What they would do is they would give you the formula and you would have to draw the picture and then "hmm. I've got that bond here. This is going to make this kind of structure." So if you got that right, you would usually know the shape and be able to get

> at least one of the names right, if you'd keep it straight. But, it was just getting the names straight on that one I feel like was the harder part of that.

(ASL) Jason struggled to understand the concepts of ASL grammar. He expected it to be like English grammar, but when it was not, he struggled to accommodate the new ideas in his way of thinking.

> We don't really hate it or dislike it, but we were thinking, "I'm not sure I want to go through three more classes of this." And the grammar of sign language didn't really click with me, even though the teacher explained it. I still treat the grammar like it's English grammar, which is not right. So, I never really knew if I was doing it wrong or not.

Career application, Career activities

(Chemistry) Jason struggled to apply the course concepts to real life, specifically to future career activities. He didn't have an accurate concept of what his professional activities would be like. He had no role model or mentor helping him to make sense of the chemistry experience in relation to his goal to become a PA/PT. Jason had expectations of what a PA/PT does and the course concepts didn't relate well to those expected activities. This drove Jason to change his expectations of what a PA/PT does, which led him to conclude that he didn't want to do be one anymore.

> I wasn't putting myself in the role. But I think it goes to an even deeper issue. With school in general there are classes and things that you don't really want to take.
> I never had a desire to take Chem 105, but in my major at the time, exercise science, I had to take Chem 105. So when I think of exercise science, I think of working on people. I think of working with joints and looking at an injury and trying to treat it or trying to help someone. But I don't see or I never had a desire to get how the molecules work – like what happens to baking soda and vinegar when they come together and explode. I didn't see the relevance of that. When the teacher, Macedony, would come out with a cool fact about the human body or whatever, "and this is why this happens," then I could see through the veil so to speak – between chemistry and exercise science. I could see that there was an actual application there like why electrolytes are needed in the human body, "because the salt does this." There's an application there, you know? And so I kind of perked up a little bit.
> The only help I gave myself in getting through math courses at the college level is that if I found something that I loved enough – the idea of doing something in the future that would push me through all the crud. You know? And so I didn't feel like becoming a PT or some kind of doctor or someone in the medical field. I didn't feel excited enough about that to say, "Yeah. I'm going to go through this no matter what."
> But, I kind of wish I hadn't just switched out of the major just like that. But, at the same time I think it's a difficult thing because you don't know if there is actual application. I believe they must be having you take it for a reason. That's kind of in the back of your mind. Or, "is this what I'm doing for exercise science?." Honestly, there might be some application and stuff but, I thought about it more and concluded that I should have looked through the major more. It was a lot more involved in physics than I was originally expecting. It's just frustrating. I kind of don't regret changing out of the major.

Effort attribution

(Chemistry) Jason cites lack of effort, rather than lack of ability for his learning failures. He believes he could have succeed in the course had he made the effort (i.e. put in the time). He didn't project that the effort to succeed would be worth the end result – work as a PA or other professional in the medical field. By attributing his failure to a lack of effort, he avoided the social shame that comes from a lack of ability. Jason was not interested in learning the course concepts because he didn't understand how it related to his desire to become a PA.

> At the beginning I did well then I kind of dropped off because I got focused on other classes and lost focus on Chemistry.
> But for Chem 105 I was totally burned out. And I just went into it in the testing center and just took it without studying. Worst idea ever!
> Macedony himself, tried to really put out opportunities for us. He didn't try to turn us down from seeing the professor and stuff and they need to be like that. But then there's the fact that students aren't really comfortable doing that or they don't feel like it's a high enough priority to go talk to them. I've just never really been one of those kids myself.

Social anxiety

(Chemistry) Jason' fear of social embarrassment kept him from asking questions and getting help in class. He tried to resolve his learning failures by watching what other students did. He didn't feel confident in any of his own answers. He justified his learning failures because of other students' failures in the course.

> But in the big lecture class, I was going to make sure that my questions had some punch – that they were good questions. I wasn't going to be throwing out any dumb ones and have everyone or the teacher make fun of me at my expense. The teacher would joke around and stuff, but I didn't even ask a question, I don't think. I don't know.
> the TA would have a student go up and they would work out the problem in front of you. So there were a lot of smart kids in the class who were really on top of it and once they went through it, I could kind of see where I went off from them or when I did the same thing as them and tried to get the right answer.
> everybody just didn't do well at it. I know I wasn't the only one in class that wasn't doing so hot at it because we had several people that had to go up and do the scientific notation for these huge numbers and we got them wrong fairly consistently. Then the TA would explain and we thought "oh!." And then the next class period, I remember Macedony was saying, "This gets a lot of people." I remember him saying that and it really does. It got me plenty of times and it got everybody else too –
> She changed majors because of the class too. She had the same exact experience that I did – same teacher. She was in the same section, the same group. She was in my section and when we started talking about it, we were right on with each other. We knew exactly what each other were talking about. I think a big part of it was that we both didn't put in the time when it was really necessary to get the basic fundamental things down the beginning. One thing that was different between us is that she said she pretty much didn't understand what was going on the whole time. I think that's pretty common. There are males and females – this may or may not be true, but I feel like guys think, "I understand this, but I don't understand this." It's pretty cut and dry. But in conversation, a lot of girls

> say, “I had no clue about a single thing that was going on.” They kind of look at the big picture and say, “none of that made sense.” And so that was one thing that was different. But, she kind of evened out and did better than I did in the class because she studied for the final and she did the small things and did the homework and double-checked. We had the same level of patience and we always ended up with similar answers, but we didn’t understand why they were right or wrong. Does that make sense? And we were so confused or we were just so frustrated or just the combination of all of the feelings that we were feeling that we made changes to our life’s direction because of the feelings that came up – that frustration and lack of knowing what was up, that lack of knowledge.

(ASL) Jason recalls feeling embarrassed by his lack of ASL skill when he was asked to sign in front of his peers.

> I was just throwing out signs that I knew because I was scared and I was freaking out. And so, I think it just stands out because it was a more socially embarrassing situation for me.

Course structure

(Chemistry) Jason had difficulty with the course structure not allowing for “learning by guessing.” He struggled with the course concepts and the course assignments reinforced those difficulties. The homework didn’t help him much either.

> In my Chem 105 class, the teacher created a system where you were doing your own work and you had an opportunity to learn and get some things wrong sometimes. But, you weren’t going to get the right answer, for the most part, if you didn’t know what was going on in the problem. And usually you had lots of choices on Chem 105 tests, like A through J. So it was like this drawing of the potassium pump again. It was a drawing of these two lines going across and you have this tube thing and this molecule thing going in and out of it. And I’m thinking, “how?.”
>
> The homework was good, the online stuff. It was a good program. Once I really started putting my head to it, I picked up more out of the homework than anything else.

Poor analysis

(Chemistry) Jason was not able to properly analyze his learning failures; they remained a mystery to him. He could not understand why he failed to understand the course concepts. He remembered parts of the concepts but was unable to identify the ideas that didn’t make sense to him. Sometimes he would think an idea was correct, only to find out his understanding was flawed. This unresolvable learning failure frustrated Jason. He failed to metacognitively evaluate the experience and identify his errors. His vague attempts to analyze his failures were never conclusive.

> I just feel like it was something that was really easy that somehow got way too complex. If that’s what it was, then I remember that if you were trying to find an energy level of the different elements and everything, the elements shoved together. Then you were trying to find what the final energy state would be. I could never figure that out. I never understood that one. I wasn’t sure if it was supposed to be the energy levels added on top of each other or if they were subtracted from each other or if it was between the two energy levels or something. I just never understood the electron and its states.

> I would try to put some reasoning behind it but it was not anywhere close. I was really off. I went back and forth because that was where I felt a lot of the knowledge was really being drawn together.
> One thing I struggled with bonds was when you have these different elements coming together, these different compounds in a molecule and you're supposed to draw out the molecule. Somehow I'd always get a different drawn molecule than what they would put up, even though it had the same, what is it? Formula? It was specifically with nitrogen, like N-O-3 or something, nitrate. I would somehow write it out or I thought it had potassium in it or something. It was nitrogen, phosphate, or man! It was N and P in an equation or formula and I was supposed to draw out the molecule and what it would be. Somehow I would end up with the right amount of molecules and elements in the molecule and everything, but somehow I was wrong. Does that make sense? Even though it looked the same – it was the same – it was right by the numbers and letters. I never did understand why that was wrong – why this was wrong and this was right. At the time I felt like there was an easy difference. I really don't remember it though. I know that you write out like H-2-O and the other one. Actually, I don't think it was the actual molecule. I don't remember what it was, but it was something,
> for some reason I could just never come out right with it. I think I had problems with the conversion. I was still developing and working with the moles. So I got the conversions down and sometimes would get it right. Then other times I just thought "no, no, no." You could come out with the right answer but then you would name it wrong and then get it all wrong. So, you would know the shape, but not the name and that was frustrating. And I remember there were two separate ways to name. It was this kind of bond structure and this kind of molecular structure and you had similar names within the bond and the molecular structures. You could get so confused if it was tetrahedral over here but it wasn't a tetrahedral in the molecular structure over there. A linear and a linear – those are pretty easy molecules. And if you had two molecules and they were kind of linear and then you add a third out here that was a 45-degree angle, you were supposed to name that like a saw-bond structure. And then its molecular structure, it was linear, even though it wasn't. I don't know.

Teacher responsibility

(Chemistry) Jason does not hold the teacher responsible for his learning failures. He says that his learning failure is due to his own shortcomings.

> He really cared about the education of students and he wasn't just throwing stuff out there trying to sound intelligent or anything. He is a great teacher and in the beginning he told us, "this is hard stuff. I'm not going to make it easy on you."

Self-awareness

(Chemistry) Jason learns about his strengths and weaknesses, as well as his academic preferences because of his learning failure. He realizes that he does not enjoy chemistry or math.

> I like dealing with science conceptually. I think I deal better with the bigger picture than I do with technical specifics.

> I'm horrible at math. Math is my worst subject ever and Chem 105 was one of my first science classes where I had the science and the math kind of coming together.
> it wasn't just the Chem 105 itself, it was the fact that I didn't feel like I could push myself through the math. I didn't feel like I could.

Poor preparation

(Chemistry) Jason does not feel as prepared as the other students in the course because he has forgotten what was covered in his high school chemistry class.

> And I hadn't done chemistry since high school – probably my junior year, I'm guessing.

Learning strategies

(Chemistry) Jason struggled to learn the course concepts because he struggled to know how to learn them. He attended lectures, labs, and recitations, and still he continued to experience learning failures. He guessed at the answers on the homework because he didn't understand the concepts. Jason stated that his goal was not retention of the course concepts. These poor learning strategies and motives contributed to his learning failure in the course.

> You come, you read, and you study. You read through it and it's not just a quick scan. You really read it. And then you have questions. Then you have two opportunities to really get out your questions: a lecture and your section recitations. In lecture you go over general problems to rehash what you've read in general terms. Then you go to recitations. I can't remember if homework was due before recitations or sometime afterwards. I think it was afterwards. I think you had until the next lecture, but I'm not sure. So in recitations the teacher went a little deeper into what you needed to know. He talked to you in student-to-student terms. So you could get your questions out and get it all pounded into you again. And then you were supposed to do the homework and know what you were doing when you got to the homework. But I used the homework like a lot of kids do.
> But I used the homework like a lot of kids do. I went through the homework and just bounced off the walls until I got in the right spot. And you had a certain number of tries for each problem. I don't remember how it worked, but if you didn't get it right the first time, you got a little point deduction and you would just get points deducted until they were forced to give you the right answer.
> I really started paying attention in class and reading when I could, and really trying to stay awake in recitations and learn how to do it right and take notes on it. I think a big thing was really just taking my own notes personally and looking back on those when I was doing my homework. Then I really started doing well on the homework. So that helped me a lot.
> The octet rule was one I remember it being simple in the beginning but then it got more complex. So when you are supposed to count how many electrons obviously you had more than eight, but I don't know. Maybe I would get so focused on a problem that I would forget there was this octet rule and I would miscount or not put down what was supposed to be there. I think because I didn't do well with the studying of it generally, that one part was ok but for the other parts, I just didn't really bother to try for retention. My retention was just really bad because I can't really remember it now.

> I don’t have a chemistry book anymore because I had the online version. I don't know why I did that. It was handy I thought. There's really trade-offs between electronic and the physical copy. I probably should have done a physical copy because I think it would have been easier to look at something on the computer than look at the book. I think it could have been better sell back wise. That's usually what I think of now is sell back price. Sometimes I would read the book and sometimes I wouldn’t. It was weird.
> I think I’m getting topics mixed up here too. I definitely did not try to retain this stuff. I just kind of mashed into my brain to the point where I could say, “Okay, this is what I’m supposed to do here” and then build up to the next problem, the next kind of idea. There was that. I also remember specifically in Chem 105 there was a lot of memorization, like elements and formulas and all that stuff. And in memorizing that stuff, I didn’t really focus on that until the very last moment and I didn’t really get it.

Social justification

(ASL) Jason justifies his learning failures by citing the learning failures of his peers in the course.

> I’ve talked to a lot of girls in the class and they kind of did the same thing as me. We were all excited to get into it and then we all got kind of tired of it and we just kind of left off

Instructor conflict

(ASL) Jason’ lost confidence in the instructor when the feedback he received was inconsistent. This lack of consistent feedback added to his confusion about ASL grammar and contributed to his learning failure.

> They’ll see the context of what you’re trying to say with your signs and try to put it together. Sometimes it doesn’t work, but sometimes it does. So, the teacher knew sign language and I think she knew what I was trying to say most of the time. She did correct me and stuff but I feel like it wasn’t consistent.

Past experience

(ASL) Jason draws on past experience to describe his motives for taking the ASL course and as a basis for understanding the course concepts. His past experiences continued to frustrate him enough that he wanted to learn ASL. His past experiences also created expectations for the ASL class and the learning experiences he would have. Jason expected to learn ASL grammar in the course and when he failed to learn it, he felt even more frustrated.

> And I was so frustrated that I couldn’t talk to him. It was kind of funny because we always thought, “oh, we don’t know sign language” and he didn’t really know sign language. He knew basic stuff.
> We were just trying to explain the first sentence and the second sentence. “God is our loving Heavenly Father. He knows you Kenny!” and it frustrated the heck out of me because I was used to thinking, “okay! We’re going to do the first lesson here and the second lesson” and of course you’re supposed to try and apply it to the person and stuff. I understand that to a degree, but I’d never seen anybody where they wanted to learn it, but

> had to go through the lessons so slowly. So, I came back here and I thought, "I want to learn ASL" so that one day I'll be able to go back and say, "Hi. My name is Jason" and just do all that stuff.

Minimizing failure

(ASL) Jason tried to explain how his learning failure in the class probably won't affect his future too much, but his disappointment with not being more skilled in ASL communication is evident.

> I haven't really run into very many deaf people either and I feel that with Kenny back in Pompeii, I could see that I at least wanted to be able to learn it so I could talk to him. I don't know, I think that's part of it, that now I can actually say, "hi. How are you – Good," you know? Even though I won't be able to talk to him about these complex ideas, we'll still be able to communicate at least. At least now I understand that I have to do facial expressions with a sign and I can still talk to him by mouthing it, shouting it, I don't know.
>
> He sees what I'm doing and you can make up stuff when you sign, you can improvise a little bit. So, I don't think the grammar is really going to matter there. That's not what I was thinking when I decided I wasn't going to do ASL anymore. I was just thinking, "well, ASL is still cool, but I'm not as excited about it as I was."

Failure reactions

Jason had a different learning goal for each course. As a result, his reaction to each learning failure was different. He was satisfied with mediocrity in ASL, he was apathetic about PDBio, and he was really frustrated with Chemistry.

Instructor expectations

Although Jason emphasizes the importance of his own efforts to learn the material in his classes, he does have expectations of his instructors. One of these expectations is consistent feedback. Another is that the instructor feels invested in the success of the students.

Social difficulties

Most of Jason' difficulty in his classes related to poor social interactions/expectations. He failed to get the help he needed because he was embarrassed to ask his questions in front of his peers. He did not feel any strong personal connections to other students or the instructors, which would have supported him through his difficulties. He focused on the failures of others so he could justify his own failures instead of focusing on their successes so that he might also find ways to succeed.

Stake multi-case analysis worksheet #4 – Amy-Jason – Cross-case

Amy-Jason Comparison - Worksheet 4. Estimates of Ordinariness of the Situation of Each Case and Estimates of Manifestation of Multicase Themes in Each Case

W = highly unusual situation, u = somewhat unusual situation, blank = ordinary situation
M = high manifestation, m = some manifestation, blank = almost no manifestation

	Chemistry Jason	ASL Jason	Chemistry Amy	Statistics Amy
Ordinariness of this Case's situation:	W	W	W	W
Original Multicase Themes				
1. Learning failure	1 WM	1 WM	1 WM	1 WM
2. Conceptual difficulty, Conceptual framework, Hard concepts	3WM	4uM	7 uM	2 WM
3. Career application, Career activities, Career relevance, Lack of interest	2uM			
4. Effort attribution	8um		6 WM	
5. Social anxiety	10um	2Wm	5 WM	
6. Course structure, Instructional strategies, Pedagogical conflict	11um		4 um	
7. Poor analysis, Analyzing problems	4 WM		WM	3 WM
8. Teacher responsibility, Instructor conflict	5Wm	5Wm		
9. Self-awareness, Self-doubt, Self-concept, Confidence issues	6 Wm		2 WM	6 um
10. Poor preparation	7 Wm		uM	
11. Learning strategies, Study strategies	9 Wm		3 um	3 um
12. Social justification		3 WM		
13. Past experiences	um	6 WM		
14. Minimizing failure		7 WM		
15. Social dynamics, Limited relationships, Social interactions			uM	7 um
16. Failure reactions	WM	WM	WM	WM
17. Instructor expectations	5Wm	5Wm		
18. Social difficulties	Wm	WM	uM	7 um
19. Time management	uM			5 WM
20. Remediation				8 WM
21. Social dependence			WM	WM
22. Vague goals	uM	WM	WM	WM
Added Cross-Multicase Themes				
23. Unique failures	WM	WM	WM	WM

High manifestation means that the Theme is prominent in this particular case study.

A highly unusual situation (far from ordinary) is one that is expected to challenge the generality of themes.

As indicated, the original themes can be augmented by additional themes even as late as the beginning of the cross-case analysis. The paragraphs on each Theme should be attached to the matrix so that the basis for estimates can be readily examined.

Original Multicase Themes

Learning failure

(Chemistry) Jason' goal was to earn high grades on the tests and in the course as well as understand the course concepts. He failed to accomplish these goals and so he shifted them because his learning failures went unresolved. Jason modified his learning goals to match his learning preferences and his perception of his learning capacities.
(ASL) Jason wanted to learn ASL grammar in this course, but he failed to do so. Even though he earned a high grade in the course, this still stood out to him as a learning failure.
(Chemistry) Amy's original goal was to earn a high grade in the course. After here initial learning failure, her new goal was to avoid failing the course. She also wanted to understand the explanations of the instructor. She struggled to work through the "confusion" associated with the course concepts until they were no longer confusing. She wanted to master the course concepts, but failed to invest the time necessary to master them.
(Statistics) Amy wanted to get an A grade in the course the first time that she took it but she quit because she couldn't understand the concepts and she did poorly on the homework.

Conceptual difficulty, Conceptual framework, Hard concepts

(Chemistry) Jason' failure to learn concepts early in the course led to greater difficulty with later concepts. One of the reasons Jason struggled with the concepts is that he could not see their application to his idea of real-world experience as a PA/PT. In general, Jason struggles conceptually with scientific ideas. He lacks an overall framework for understanding the ideas as they relate to one another and as they relate to the physical world. His understanding of scientific principles comes from trial and error and inconsistent feedback from peers and instructors. He would begin to understand a concept, but then a nuance or complexity was introduced and his entire understanding was destroyed. Jason couldn't understand the course concepts because it didn't fit within his understanding of what a PA/PT does. He didn't have previous experiences that gave him a foundation for understanding the basic principles of chemistry.
(ASL) Jason struggled to understand the concepts of ASL grammar. He expected it to be like English grammar, but when it was not, he struggled to accommodate the new ideas in his way of thinking.
(Chemistry) Amy expected that the course concepts would follow predictable laws that would make sense within a framework. The apparent lack of "predictability" of the course concepts made her learning failure worse. She believed that there was a "right" way to understand the course concepts that continuously eluded her. She felt that the course concepts did not relate to anything that she was familiar with and so she struggled to reform her ways of thinking to accommodate the new ideas. Amy had the beginnings of a conceptual framework for the course

concepts because of previous experiences, but her framework was not sufficient to tie together all the concepts in a coherent way. She came away from the course "less confused" instead of "understanding" the course concepts.
(Statistics) Amy failed to understand the definitions of the course concepts because they did not relate to her past experience with math and other concepts that she thought should be related. She was confused by the difference between BYU definitions and definitions that she came across on the internet. She also struggled to understand how the course concepts applied to real life.

Career application, Career activities, Career relevance, Lack of interest

(Chemistry) Jason struggled to apply the course concepts to real life, specifically to future career activities. He didn't have an accurate concept of what his professional activities would be like. He had no role model or mentor helping him to make sense of the chemistry experience in relation to his goal to become a PA/PT. Jason had expectations of what a PA/PT does and the course concepts didn't relate well to those expected activities. This drove Jason to change his expectations of what a PA/PT does, which led him to conclude that he didn't want to do be one anymore.
(PDBio) Jason couldn't clearly see how this course applied to his future activities as a PA. Because of this difficulty, he was unable to understand the course concepts – he had no basis for understanding them.

Effort attribution

(Chemistry) Jason cites lack of effort, rather than lack of ability for his learning failures. He believes he could have succeed in the course had he made the effort (i.e. put in the time). He didn't project that the effort to succeed would be worth the end result – work as a PA or other professional in the medical field. By attributing his failure to a lack of effort, he avoided the social shame that comes from a lack of ability. Jason was not interested in learning the course concepts because he didn't understand how it related to his desire to become a PA.
(PDBio) Jason cited his lack of effort and study time as the reason for his poor comprehension and course grade. He stated that he did not put in the time necessary to learn the material because he could earn a good grade in the class without studying. His efforts were also directed to other, more challenging classes.
(Chemistry) Amy's tried to learn the course concepts on her own, but what she needed was help from someone else. She expected to understand the course concepts easily and when she didn't, she attributed the learning failure to a lack of effort. She felt like she wasn't putting enough time into the course. Amy thought that she could just "keep going," putting more effort into the course even though she was not learning the concepts.

Social anxiety

(Chemistry) Jason' fear of social embarrassment kept him from asking questions and getting help in class. He tried to resolve his learning failures by watching what other students did. He didn't feel confident in any of his own answers. He justified his learning failures because of other students' failures in the course.

(ASL) Jason recalls feeling embarrassed by his lack of ASL skill when he was asked to sign in front of his peers.
(Chemistry) Amy's learning failure happened because she did not ask for the help she needed. She didn't want to inconvenience the professor or the other students because she perceived that she was the only one struggling with the concepts. She also felt underprepared for the course because she did not take a chemistry class in high school like many of the other students. Amy felt inferior to the others in the course because of her learning failure and because of her perceptions of the relative successes of other students. She also felt that the large size of the course and the poor seating arrangements contributed to her learning failure.

Course structure, Instructional strategies, Pedagogical conflict

(Chemistry) Jason had difficulty with the course structure not allowing for "learning by guessing." He struggled with the course concepts and the course assignments reinforced those difficulties. The homework didn't help him much either.
(PDBio) Jason believed that his grade was a high as it was because of the weighting of assignments, which was clearly not something he caused by his own efforts. This belief was reinforced because he failed to learn the course concepts that were covered in the course, but he earned a good grade. The course structure was foreign to him and unlike his previous experiences with biology classes in high school. This lack of familiarity with the content and structure contributed to his learning failure. Jason believed that the course structure allowed him to accomplish his goal of getting a good grade in the course, but led him to fail in his goal to learn the course concepts.
(Chemistry) Amy remembered the good instructional strategies related to learning about dimensional analysis. The instructional strategies for other topics were not as helpful.

Poor analysis, Analyzing problems

(Chemistry) Jason was not able to properly analyze his learning failures; they remained a mystery to him. He could not understand why he failed to understand the course concepts. He remembered parts of the concepts but was unable to identify the ideas that didn't make sense to him. Sometimes he would think an idea was correct, only to find out his understanding was flawed. This irresolvable learning failure frustrated Jason. He failed to metacognitively evaluate the experience and identify his errors. His vague attempts to analyze his failures were never conclusive.
(Statistics) Amy's lack of ability to analyze and understand the assignment problems contributed to her learning failure.

Teacher responsibility, Instructor conflict

(Chemistry) Jason does not hold the teacher responsible for his learning failures. He says that his learning failure is due to his own shortcomings.
(ASL) Jason' lost confidence in the instructor when the feedback he received was inconsistent. This lack of consistent feedback added to his confusion about ASL grammar and contributed to his learning failure.

Self-awareness, Self-doubt, Self-concept, Confidence issues

(Chemistry) Jason learns about his strengths and weaknesses, as well as his academic preferences because of his learning failure. He realizes that he does not enjoy chemistry or math.
(Chemistry) Amy remembered the feelings of self-doubt created by her poor testing experiences in this course. She learned from her learning failure that she wasn't as strong a learner as she thought she was. Her learning failure led her to doubt her ability to learn in other courses at the university. This self-doubt negatively impacted her engagement in the course. However, once Amy understood a concept, she had really positive feelings about the learning success, which counteracted some of the self-doubt.
(Statistics) Amy was not confident in her ability to understand the course content. She built her confidence by relying on help from siblings who had already successfully taken statistics.

Poor preparation

(Chemistry) Jason does not feel as prepared as the other students in the course because he has forgotten what was covered in his high school chemistry class.
Learning strategies, Study strategies
(Chemistry) Jason struggled to learn the course concepts because he struggled to know how to learn them. He attended lectures, labs, and recitations, and still he continued to experience learning failures. He guessed at the answers on the homework because he didn't understand the concepts. Jason stated that his goal was not retention of the course concepts. These poor learning strategies and motives contributed to his learning failure in the course.
(Chemistry) Amy consistently showed up late for class, which contributed to her learning failure.
(Statistics) Amy was able to resolve her learning failure by improving her study strategies.

Social justification

(ASL) Jason justifies his learning failures by citing the learning failures of his peers in the course.

Past experience

(ASL) Jason draws on past experience to describe his motives for taking the ASL course and as a basis for understanding the course concepts. His past experiences continued to frustrate him enough that he wanted to learn ASL. His past experiences also created expectations for the ASL class and the learning experiences he would have. Jason expected to learn ASL grammar in the course and when he failed to learn it, he felt even more frustrated.

Minimizing failure

(ASL) Jason tried to explain how his learning failure in the class probably won't affect his future too much, but his disappointment with not being more skilled in ASL communication is evident.

Social dynamics, Limited relationships, Social interactions

(PDBio) Jason distinguished between himself and the "smart guys" in the course. This self-defeating perception of himself led Jason to a lack of confidence in his understanding of the course concepts, which contributed to his learning failure. He justified himself in his learning failures because of the perceived over-qualifications of others in the course. Jason also pointed out the learning failures of others to justify his own failures.
(Statistics) Amy's stronger relationships the second time she took the course contributed to her success. She persisted when she had others encouraging her to work through her learning failures.

Failure reactions

Jason had different learning goals for each course. As a result, his reaction to each learning failure was different. Jason was satisfied with his mediocre learning in ASL, he was apathetic towards his failures in PDBio, and was really frustrated with his failures in Chemistry.
Amy had different learning goals for each course. As a result, her reaction to each learning failure was different. Amy was frustrated with her failures in Chemistry, ambivalent towards her failures in American Heritage, divided in her experiences with Anatomy, disinterested in Methods and Health Promotion, inspired to work harder due to failures in Research and Evaluation, and motivated to become a TA after working through her failures in Statistics.

Instructor expectations

Although Jason emphasizes the importance of his own efforts to learn the material in his classes, he does have expectations of his instructors. One of these expectations is consistent feedback. Another is that the instructor feels invested in the success of the students.

Social difficulties

Most of Jason' difficulty in his classes related to poor social interactions/expectations. He failed to get the help he needed because he was embarrassed to ask his questions in front of his peers. He did not feel any strong personal connections to other students or the instructors, which would have supported him through his difficulties. He focused on the failures of others so he could justify his own failures instead of focusing on their successes so that he might also find ways to succeed.

Time management

(Statistics) Amy struggled to manage her time across her classes, which contributed to her learning failure. When she put in the time to go to the labs she was able to learn the material.
Remediation
(Statistics) Amy was able to resolve her learning failure the second time she took statistics because she was able to fill in the gaps in her understanding. Resolving her learning failure led Amy to pursue additional opportunities for learning statistics.

Social dependence

Amy relied heavily on her relationships with other students to learn course concepts, to accomplish assignments, and to morally support her during her experiences. When these social relationships were strong and supportive, Amy thrived. When they were absent, she struggled.

Vague goals

Jason lacked a clear set of goals for his life, including a poorly defined set of professional activities he anticipated after graduation. This lack of clear goals and expectations greatly contributed to his learning failures. He struggled to understand course concepts because they did not relate to his career goals or his anticipated career activities. Ultimately, his learning failure experiences led Jason to clarify his learning goals and his expectations of future career activities. Amy's lack of clear goals for her life greatly contributed to her learning failures. She struggled to understand course concepts because they did not relate to career goals or her previous experiences. Additionally, she struggled to relate well to instructors and students in courses that she was not interested in, which made it difficult for her to learn the concepts (see Social dependence theme). Her poor performance led to her lack of confidence in her career goals, her learning strategies, and in her own capacity to succeed as a student. Once Amy established clear goals for herself, she began to experience success either through overcoming her learning failures or establishing new learning goals.

Unique failures

Each failure experience that Amy and Jason shared had unique elements that make generalization of trends across the experiences difficult. This is true in comparisons between both students, but also in comparisons across their individual experiences. Neither student failed the same way or for the same reasons in multiple courses. While there were a few common elements across the learning failures such as social dynamics, course structure, and relevance to future activities, there was an even greater range of interesting differences. For example, Amy worked hard to overcome her learning failures in Statistics to the point where she was able to teach the concepts to others. However, in her Chemistry course, she failed to understand the concepts sufficient to earn a passing grade. Jason wanted to learn ASL to communicate with a friend from Micronesia, but only succeeded in learning a limited number of words without the grammar rules. He failed to understand the concepts of Anatomy in PDBio, but was able to earn a passing grade in the course. These inconsistencies across the experiences emphasize the unique nature of learning failure experiences both by individual and by context.

Stake multi-case analysis worksheet #6 (Modified)

Worksheet 6. Multi-case Assertions for the Final Report

#	Title	Assertion	Evidence in Which Cases
1	Recognition of learning failures	The way that students recognize their learning failures varies from context to context. For some, it comes when they receive the final grade in the course. For some, it comes after getting a test back. For others, it may be when they ask an awkward question in class. When a learning failure is recognized makes a difference in whether or not it is resolved. The nature of the course outcomes (conceptual, skill, social, etc.) may affect how students identify and evaluate their learning failures. Formative feedback is one of the key ways that students identify and evaluate their learning failures.	All
2	Past Experiences and Future Expectations	A student's concept of the activities he/she will be doing in the future motivate them to persist through their learning failures until they are resolved. These expectations for future activities, like past experience, serve as a basis for learning course concepts. If students have a vague understanding of the relation between course concepts and expected future activities, it becomes difficult for them to understand the concepts. Student's past experiences influence their expectations and learning goals for their courses and affect how they fail in a course. Past experiences motivate and create expectations for course learning experiences that influence how students experience learning failure in the course. Learning failures are influenced by a student's goal for their future. Learning failures also influence the clarification and revision of a student's future goals.	All
3	Evaluating Learning Failures	Without the ability to analyze learning deficiencies or to evaluate reasons for poor performance, students will flounder and remain incapable of resolving their learning failures. A student's capacity to evaluate their learning failures is critical to their capacity to resolve their learning failures. The nature and severity of a student's learning failure experiences influences the degree of their reflection on those experiences. The perceived difficulty of the learning failure plays a critical role in a student's decision whether or not to resolve it.	All
4	Self-Discovery	Learning failures are an important part of the self-discovery process. They lead students to consider their motives, goals, and expectations, as well as to reform those in light of the failure. It may be that some students fail to resolve their	All

		learning failures because they choose instead to revise their goals. Learning failures create an opportunity for students to become more self-aware and to learn more about themselves. Resolving learning failures changes student perceptions and attitudes about course concepts and about their capacity to accomplish future learning goals.	
5	Social Impacts on Learning Failures	Students may justify their learning failures and their decision whether or not to resolve them based on relative learning failures of others around them. The types of social relationships that students have with peers, TA's, and instructors influence how they experience their learning failures. Justifying learning failures based on the experiences of others or minimizing their meaning and importance for future experiences may prevent them from being resolved. The nature of relationships with peers, TA's, and the course instructor can contribute both to learning failures and to their resolution. Mentors who can help students see relationships between expected future activities and course concepts may be able to encourage students to work through their learning failures.	All

APPENDIX F: Instruments

Sample Interview Protocol

"Thank you for meeting with me. I have asked for the Freshman Mentoring Office to connect me with students who are willing to discuss their learning experiences here at BYU. My goal is to document and better understand students' learning experiences, especially the unsuccessful ones. Each interview can last anywhere from thirty minutes to an hour and it may be necessary to meet multiple times. I am not paying anyone to talk to me about their experiences, but most people who have worked with me have said that they have enjoyed the experience and that it has helped them to better understand their learning experiences. Based on all of this, are you still willing to discuss your learning experiences with me?"

If yes – Have participant complete IRB consent form. Highlight the possibility of multiple interviews. Start audio recording.

If no – Work with Freshman Mentoring to identify additional individuals. I may also ask if the participant knows of anyone else that may be interested in talking with me.

Sample questions:

- Can you please tell me about your BYU learning experience overall?
- What particular classes have been the most difficult? How and why?
  - Which topics stand out as being the most difficult for you? Why?
  - What particular experiences with these topics stand out from the others? Why and how?
  - Can you please share your experience with me?
- When/How did you realize that you were having difficulty learning the concept?
- What did you think the problem was? Why?
- What did you do after you realized there was a problem? Why?
- Did you work with others to resolve the learning problem? How?
- Did your understanding of the problem change over time? How?
- Did this learning difficulty affect the rest of your BYU experience? How
- Did this learning difficulty affect your personal learning goals? How?
- Since this experience, have you done to learn more about the concept? What did you do?
- What words or phrases would you use to describe your experience with this concept? Why?

Debrief on the interview, share thoughts about key information and themes from the interview, schedule a follow-up for the next week, and ask if the participant has any questions, suggestions, or concerns.

Transcription Protocol

Formatting:

At the top of the first page include:
- Name of Interviewee(s) and session number
- Name of Interviewer(s)
- Date of Interview
- Name of Transcriber
- Date of Transcription
- Duration of Interview

Include page numbers on each page, centered, bottom.
All transcripts double-spaced with one-inch margins.
Include time-into-interview at least once on each page of transcription.
Speakers will be identified by first name all in capital letters at beginning of each statement:

BENJAMIN: I haven't thought a lot about it since then. I guess so.
PI: What are your thoughts on it now?

Indicate the end of a tape/beginning of a new tape in all capital letters.

Content:

Include comments such as {laughs} or {points to…} or pauses {…}in curly braces.
Use bold uppercase to show emphatic in speech.
Bracket any necessary explanations {interruptions, recorder turned off, etc.} in curly braces.
Cross-talk – times when multiple people are talking – will be designated by the additional dialogue being enclosed in parenthesis:

BENJAMIN: It was kind of funny how (like you were trying so hard but it wasn't working) yeah and I didn't know what to do.

Words that are difficult to identify in the text will be designated in brackets with a question mark at the end:

BENJAMIN: The professor jumped into the lecture on [gasmotestinitis?] that no one understood anyways.

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