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Lowering the walls and crossing boundaries: applications of experiential learning to teaching collaboration

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Bill J Bonnstetter[2]

Abstract Higher education is being confronted with a paradigm shift that is forcing it to collectively reexamine their ability to develop graduates who have relevant professional competencies. Collaboration and team work are competencies that are sought after by many employers. The creation of effective collaboration is critical to developing the interdisciplinary linkages that are necessary to confront the many environmental challenges posed by human activities and prepare today's students to meet future intellectual and workforce demands. To address the challenge of developing collaboration skills, the Environmental Studies (ES) program at the University of Nebraska-Lincoln (UNL) used a backward curriculum design, multiple modalities of experiential learning, and a reflective action research approach to develop collaboration and teamwork skills in undergraduate students. The ES program partnered with Target Training International Ltd. (TTI), to gain insights into the use of their instruments as boundary objects to help student's understand self and create interdisciplinary teams. Through the use of an instrument, the TriMetrix®, the UNL-ES program is taking a page from the business world and partnering with it to help students understand themselves, adapt their behaviors to more effectively work in a team, and be introduced to the concept of assessments and their use in the professional world. These assessments played a positive role in the dynamics of each group, some more than others. The analyses of these data for this class have informed us about how to improve the use of the assessment output in class. Specifically, we can use these data as specific examples in debriefing future classes. We have also identified certain mixtures of behavioral styles and motivational drivers that may be problematic to group work. Many students have experienced team projects. However, most students have not explicitly had to learn about the factors that go into effective collaboration or they have never been explicitly explained to them. This is particularly the case with regard to processes of developing shared responsibility.

Introduction

One of the biggest challenges that higher education faces is preparing today's students to meet future workforce demands (Zemsky, 2009; Bellanca and Brandt 2010; Arum and Roksa 2011; NRC 2012). One of the most sought after competencies, whether it be in business, academia, or public service, is the ability to work collaboratively on a team. Vincent and Focht (2010) concluded from an examination of studies published prior to 2009 that employers of environmental program graduates most value the skills associated with interdisciplinary teamwork, critical thinking, problem solving, communication, planning, and management. They go on further to say that these skills "may actually be more important than substantive knowledge, though knowledge of environmentally relevant natural sciences and sociopolitical disciplines are undoubtedly important." Weik et al. (2011) identified five key competency clusters that enable students to successfully engage in sustainability research and problem solving. The five clusters are

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system thinking, anticipatory, normative, strategic, and inter-personal competencies. Interpersonal competencies included the dynamics of collaboration (within and beyond academia); negotiation, mediation, deliberation, constructive conflict management, team development, and teamwork methods; and limits of cooperation and empathy.

The creation of effective collaboration is critical to developing the interdisciplinary linkages that are necessary to confront the many environmental challenges posed by human activities, develop a sustainable future; prepare today's students to meet future intellectual and workforce demands, and reinvigorate connections to society through scholarship, research, practice, and informed citizenship. At the heart of effective collaboration is helping students recognize and address the visible and invisible barriers that separate individuals. These barriers between individuals, in turn, contribute to the development of the silo effect that separate work teams, departments, programs, etc. Silos, whether they are developed in a corporation or academic institution, lead to frustration, enable turf wars, limit cooperation and collaboration, thwart communication, create redundancy, waste energy, waste resources, and, in the end, jeopardize the opportunity to create positive impacts and results.

To address the challenge of developing collaboration skills among other professional competencies needed in the workforce, the Environmental Studies (ES) program at the University of Nebraska-Lincoln (UNL) has used a backward curriculum design, multiple modalities of experiential learning, and a reflective action research approach to develop collaboration and teamwork skills in undergraduate students. In this paper, we will describe our learning outcomes, learning experiences, and activities, report on data we have collected, and then use these data to inform recommendations as to how we will move forward in future classes. More specifically, we will discuss how we have used business-based professional assessments with students to inform both them and the instructors about the visible and invisible barriers that may influence their abilities to collaborate in interdisciplinary teams.

Learning outcomes

In Fall of 2008, UNL's ES program initiated a revision of its curriculum using a backward design. Backward design is a method of designing curriculum in which you plan with the end in mind regarding what the student will be able to know and do when they complete the course of study (McTighe and Wiggins 2012). The end we have in mind for our students in the context of collaboration is defined in two of the eight program level learning outcomes: effectively work in teams and groups from various backgrounds and perspectives to address environmental challenges and demonstrate improvement in professional and interpersonal skills such as collaboration, critical thinking, problem solving, empathy, and

teamwork so they can effectively operate in society and the professional world. These program level learning goals are explicitly addressed in a sophomore level course, ENVR 201, Science, Systems, Environment, and Sustainability. That is, upon completion of ENVR 201, a student will be able to apply the characteristics of effective collaboration during a group analysis of an environmental challenge. More specific learning outcomes to support this learning goal include the following: describe and explain the factors of effective collaboration and be able to answer the question, "What are the elements of effective collaboration?," and as a member of a team, use oral and written communication skills to effectively present an analysis of an environmental challenge.

Learning experiences and activities

Course design elements ENVR 201 is designed to use a learner-, knowledge-, assessment-, and community-centered approach that is consistent with research on learning (Bransford et al. 2000; Manduca 2007). The content of this course is organized into three modules and a final semester project. Module 1 includes three units. In unit 1, students practice inquiry skills including the use of questions, accessing information, and collecting data. In unit 2, the instructor provides an introduction to the educational philosophy behind the class, basically addressing the question of why we do the things we do. It includes information about what employers want, changing educational paradigms, and teaching and learning with the brain in mind. Collaboration skills, which are used throughout the course and specifically in the final semester project, are the focus of the third and final unit.

Unit 3 consists of three elements—two homework assignments described in Table 1; in-class activity to debrief the assignments that involves the creation of a small group concept map about collaboration to support a discussion regarding the extent to which participants have experienced the characteristics of collaboration; and an instructor-based class presentation, entitled, the 4 Cs of silo busting.

Semester project The semester project provides students a forum to practice their collaboration skills as they analyze an environmental sustainability issue. Groups of three to five are formed based on their interest in a particular set of local, national, and global environmental issues identified as part of a data collection activity in the first unit of the class. In this activity, students surveyed and summarized responses from friends and family members during in the first week of class. The groups were generally provided 30 to 75 min each week during class to work on their projects for roughly 12 of the 16 weeks of the semester. The intended outcome of the project is to use the process of ethical thinking to examine and consider the different worldviews and perspectives of various

Table 1 Assignment: collaboration—defining and applying

In today's world, collaboration and teamwork are extremely important to employers. Please read the following materials and have hard copy responses or electronic responses that address the following in preparation for class:

1. Define collaboration, cooperation, and coordination

2. Describe in your own words the 7 attributes of effective collaboration in Gosselin et al. 2003

3. Summarize the 6 characteristics of effective collaborations in the Research Brief by Social Entrepreneurs 2011.

Reading material specifics:

• Read the abstract, Introduction, conclusions, and page 118, specifically - Insights Related to Building Collaborative Teams (Gosselin et al. 2003)

• Read pages 1 to 7 in Research-Brief-Building-and-Sustaining-Collaborations (Social Entrepreneurs 2011).

• Read pages 2 to 10 in Social Psychology of Collaborative Learning (Ashcraft and Treadwell 2008).

Assignment: collaboration—create a concept map. On a piece of paper, create a concept map about collaboration using resources from class (reading material above). Your concept map should have at least 20 propositions.

Fig. 1 Summary of characteristics and instruments that are part of the TriMetrix® assessment. This paper focus on DISC and motivators

stake holders related to their selected environmental issue. They are asked to identify stakeholders and explain the viewpoint of each stakeholder about the issue in the context of their values, beliefs, and ethical perspectives. Students are required to present an objective analysis of the various policy options related to their issue before advocating for a particular policy recommendation. The final products for the project are a 15-min group presentation, submission of an annotated Power Point presentation, and assessment of the degree to which each person in the group collaborated including their self-perceptions of their contribution to the collaborative efforts.

Application of business assessments The ES program partnered with Target Training International Ltd. (TTI), to gain insights into the use of their instruments as boundary objects to help student's understand self, develop professional competencies, and create interdisciplinary teams (Gosselin et al. 2013). Integrated with the activities described above, each member of the class was invited to take the TTI's TriMetrix® HD assessment. TTI is a recognized leader in the science of superior performance and holds patents in job benchmarking processes, internet delivery systems, and employee success prediction. The online instrument takes approximately 30 to 45 min. Students accessed the online survey on their own time, typically within the first few weeks of class prior to formation of semester project groups. Participation was voluntary.

The three-part tool (Fig. 1) assesses the behaviors that people bring to a position, in this case being a student, the values that motivate them to do a job, and the extent to which people have obtained personal competencies. These assessments can
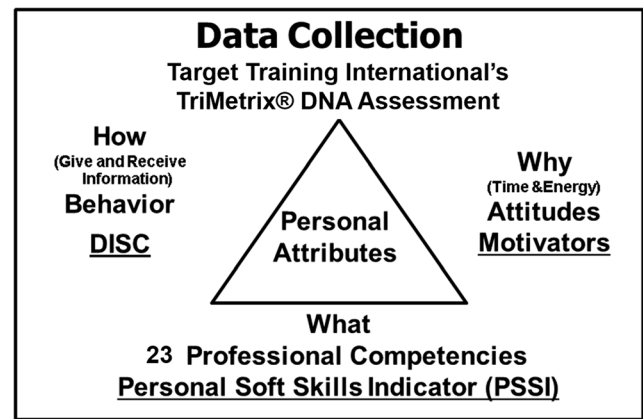
help understand what makes each of our students function. The first assessment, commonly referred to as DISC, measures normal behavior or "how" a person carries out decisions and how they want to receive communications that influence them (Marston 1928). Everyone has their own tendencies related to how they interact with other people. A person's behavioral style is influenced by many things. Regardless of its origin, it is important to understand behavioral patterns and tendencies because they influence interactions among people, how communication occurs, and how others perceive us. In the context of knowing who we are, Johnson (2014) puts it best, when he states that, "healthy teams work to understand their own styles and the styles of the others on the team, so they can communicate and work with others."

The component of the assessment that acquires information about a person's motivational drivers was developed based on the work of Spranger (1928) a German psychologist, who explored the "why" of behavior. The tool assesses six primary motivators. Theoretical reflects a search for truth or knowledge. Utilitarian reflects a desire for return on investment of time, effort, or resources. Aesthetic is a desire for form, beauty, and harmony. Social is a desire to help others, even at the expense of self. Individualistic refers to the desire to be in control of one's own destiny and the destiny of others. Traditional reflects the need to live guided by a code of conduct: religious, social, or ethnic. As with DISC, most people demonstrate each of the individual motivators to some degree but one is usually primary. For this classroom application, we focus on the behavioral and motivational characteristics of the students. Tables 2 and 3 provide more details of the characteristics measured by each instrument. Once all students have taken the assessments, the instructor guides the students through the use of the output in helping students understand behavioral and motivational styles of each member within their semester project group. The activities include a package of TriMetrix® team blending support materials including insight wheels (see below), a Power Point presentation by the instructor, and key pages from their individual, approximately

Table 2 Description of the behavioral assessment—DISC

Dimension	Describes
D	The way an individual manages problems/challenges and exercise power.
I	How a person interacts and uses their influence with people.
S	A person's steadiness, which reflects how the person responds to change, variation, and pace of their environment.
C	How an individual deals with procedures and complies with rules and other constraints that are set by others and responds to authority.

Overview: DISC describes a person's behavioral style on a continuum of four primary behavioral dimensions—DISC (Bonnstetter and Suiter 2013). A person's behavior is the blend of the intensity of all four dimensions

60-page report that each student receives upon completion of the assessment. Each person is asked to reflect on themselves and their teammates then assess the challenges their team might have regarding their characteristics. The groups then use class time to exchange their ideas regarding challenges they may face.

Data collection and reflection

Content mastery assignments At the end of each course module, content mastery assignments (CMAs) are used to document individual student learning (Gosselin et al. 2010). CMAs use an iterative grading approach to help students document and apply their knowledge of course content as defined by the learning outcomes. This approach allows participants to revisit and resubmit their assignments and CMAs until they are satisfied with their performance level (i.e., grade). Through CMAs, students indirectly use the basic elements of metacognition to achieve the cognitive goal of learning module-specific concepts. According to Livingston (1997), cognitive and metacognitive strategies are closely intertwined

and dependent upon each other. CMAs promote the use of learner-based reflection that available research indicates are effective and improve the learning outcomes of students in a variety of learning environments (Bixler 2008; Chang 2007; Chung et al. 1999; Crippen and Earl 2007; DOE 2009; Nelson 2007; Saito and Miwa 2007; Shen et al. 2007). Using this approach, we also provide students the opportunity to use their creativity and employ a variety of formats for submission that include, but not limited, to essays, annotated PowerPoint and Prezi presentations, scrapbooks, videos, and newspaper article formats. The specifics of the CMA used for module 1 are provided in Table 4. Performance level is documented using an explicit rubric.

The application of the rubric resulted in a range of scores for the 48 students ranging from 0 to 23.5 and an average of 82 % (Fig. 2). The student who scored zero was experiencing some family challenges and never completed the CMA. Nearly 40 % of the class scored above 90 %. These data indicate that overall, the students had developed the ability to describe and explain the factors of effective collaboration.

A more detailed analysis of the responses for the students who scored below 18 indicated that their responses typically

Table 3 Description of the motivators assessment

Motivator	People with this driver want to:
Theoretical	Know and discover. They have a passion for learning. They love to study, read, take classes, and conduct research. When they get involved with something new, they want to learn as much as they can. They want knowledge of knowledge sake. They will appear to be intellectual and have a tendency to be cognitive, empirical, critical, and rational.
Individualistic	Control their destiny and that of others as well. They have a desire for power, control, and recognition. They like to lead and advance their position.
Social	Give back to the community, charities, solve global social problems, etc. Also, referred to as the social worker or altruistic motivator. They value people and are kind, sympathetic, and unselfish. As a result, they are generous with their time, talents, and resources.
Utilitarian	Obtain a positive return on investment. This may be in the form of time, energy, or financial. They will focus on practical results and what is useful. They seek money for the security of their present and future, not necessarily just for themselves. They may have an interest accumulation of wealth.
Aesthetic	Create harmonious outcomes. Life is a procession of events, each needs to be enjoyed for its own sake. They have a tendency to be sensitive about conflict. An inherent interest in form, beauty, and harmony in the work. They will enjoy various form and functions of art. Long-range planning is a strength because they have to desire to create harmonious outcomes.
Traditional	Live by a certain set of standards and/or beliefs. They adhere to defined rules, regulations, and principles for living. They may have a very strong faith and/or regard for values based on family and culture. They may or may not embrace a religion.

Overview: A person's motivators provides information about why do what they do. Motivators are those things a person is passionate about, perceive as important, and/or the values that provide purpose and direction in your life. The WHY behind person's actions can be described by six motivators or drivers (TTI, 2013). The top two are considered to be you primary drivers

Table 4 Content mastery assignment for module 1

There are many perspectives that need to be considered when addressing future challenges and issues. Collaboration and teamwork therefore are very important for the development of solutions to our current and future environmental challenges. These skills are also important for you to effectively operate in the professional world.

In the format of your choice, address the following:

• Define and distinguish between collaboration, cooperation, and coordination

• Explain effective collaboration and support your description using the three references from unit 3.

• We have all experienced challenges when working in teams. Explain how you will specifically promote collaboration during group projects to address your challenges and concerns. Give at least three examples.

• We have used mind maps, concept maps, gallery walks, group data collection, among other methods, in class. Explain how you might use at least two different approaches to promote collaborative teamwork.

Content mastery assignment assessment rubric—module 1

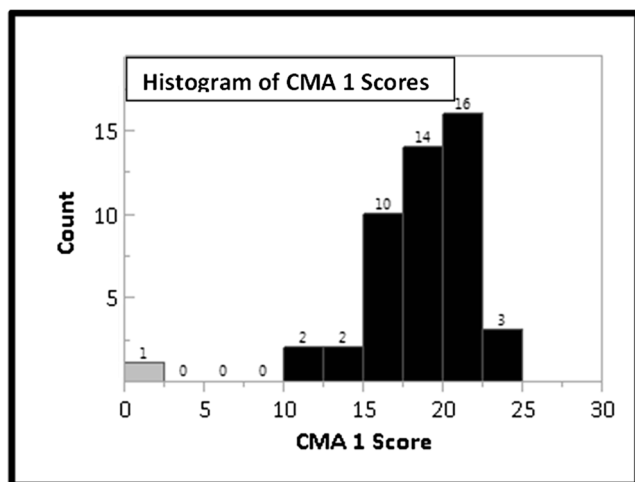| Concept	Sophisticated 4 points	Informed 3 points	Progressing	Naïve 0 points
Define and distinguish cooperation, coordination, and collaboration	Clearly defined all three terms and provide a clear explanation as to distinguish these terms from each other.	Clearly defined all three terms.	Attempted to define at least two of the terms or definitions not clear.	Unintelligible response or no definitions provided.
Explain effective collaboration and support your description using the three references from assignment 5.	Explained effective collaboration and support it with more than three specific references and linkages to course material.	Explained effective collaboration and provided some references to course material.	Attempted to explain effective collaboration; Explanation hard to follow; or no explicit use of course materials; misconceptions present.	Unintelligible response or no explanation provided.
Identified challenges and concerns related to group work.	Identified three challenges/concerns including details about their experiences.	Identified three challenges/concerns relate to group work.	Attempted to identify 1 to 2 challenges and concerns; challenges and concerns; Response hard to follow.	Unintelligible response or no challenges identified.
Explain how you will specifically promote collaboration during group projects to address your challenges and concerns. Give at least three example	Provided a detailed explanation for how they would promote collaboration including three specific examples for at least 3 challenges they have faced in the past.	Provide a general explanation as to how they would promote collaboration with some specific examples.	Provide a general explanation as to how they would promote collaboration; misconceptions present.	Unintelligible response or no response provided or used incorrect information.
We have use, among other methods, in class. Explain how you might use at least two different approaches (e.g., mind maps, concept maps, gallery walks, group data collection) to promote collaborative teamwork.	Described the use of two or more approaches including specific details about how they would use them.	Described a minimum of two approaches. More details required to how they would use them.	Provides a simple statement of how they might different approaches; only one approach provide. More details required.	Unintelligible response or no response provided or used incorrect information.
Met the requirements of the format selected.	0 or 2 points			
Bonus for creativity of presentation	0 or 2 points			
Total points (max w/o bonus = 22)				

Fig. 2 Final scores for content mastery assignment 1. See Table 4 for assignment and rubric

were missing one of two things. First, they had difficulty articulating the importance of developing a shared vision among the members of the collaborative team. This was surprising as the importance of a shared vision to the collaborative process was articulated many times during class as well as all three assigned readings. One potential explanation for shared vision not being emphasized in the responses was that it was not explicitly required in the rubric. Second, although cooperation, collaboration, and coordination were explicitly identified in the rubric as important concepts that needed to be addressed, many students did not include the distinction between these terms. This lack of explicitly distinguishing between these terms is even more surprising as these three terms were a specific focus in the in-class silo busting presentation and a reading assignment, Research Brief on Building and Sustaining Collaborations (Social Collaborations 2011).

One of the reasons for having the students make a distinction between these three words is that they are often used interchangeably, yet are distinct. The primary distinction is that collaboration requires all participants to contribute to and buy into a shared vision for the project. Collaboration results in an outcome that is much greater than the sum of its parts out of which synthesis, coproduction, and collective effort occurs. Cooperation does involve a level of sharing information and resources, but this sharing is in support of the individual's goals, not collective goals. Coordination is intermediate between cooperation and collaboration, especially as it relates to the development of collective goals.

TriMetrix assessment data—behavioral characteristics
One of the most important skills students need to acquire to be successful at any level of an organization is the ability to effectively interact. "Over 80 % of the people who move up in corporations are promoted because of their people skills, NOT technical ability." (Bonnstetter and Suiter 2013). We used the

TriMetrix® assessment as a tool to help the students work more effectively in their final project working groups. As is typically done, these groups were formed based on their interest in a particular environmental issue. The assessment helps students recognize, understand, and appreciate the different behavioral styles and motivational characteristics among the members of each group. Forty-seven students took the TriMetrix assessment.

The behavior data is presented on the TTI Success Insights Wheel® (Fig. 3). The wheel is divided into four quadrants based on the influence that the four primary behavioral dimensions, D, I, S, C, have on a person's overall behavioral characteristics. An analogy that can be used to help interpret the wheel is to imagine a magnet at D, I, S, C. The stronger the dimension influences the behavior, the stronger the force the magnet has to pull away from the center of the circle. The differential pull from the four corners results in different patterns of DISC relative to the energy line, which is the horizontal centerline, in all the small embedded graphics on Fig. 3. The pattern associated with a person whose C dominates such as student 36 in Fig. 3 has a C score high above the energy line and a D, I, S below the line. The core behavioral style is the highest point plotted above the energy line. The point spread between each of the behavioral dimension scores influence the tendencies for certain behavior. Each one of the numbered boxes on the Fig. 3 represent different DISC patterns. The inset graphs provide examples for areas 1, 6, 12, 15, 20, and 21. For more details, regarding the interpretation of the wheels see Bonnstetter and Suiter (2013).

In this class, the most dominant behavioral dimension is S, as 46 % of students have this as their highest dimension. The strengths of people with this dimension include being a steady
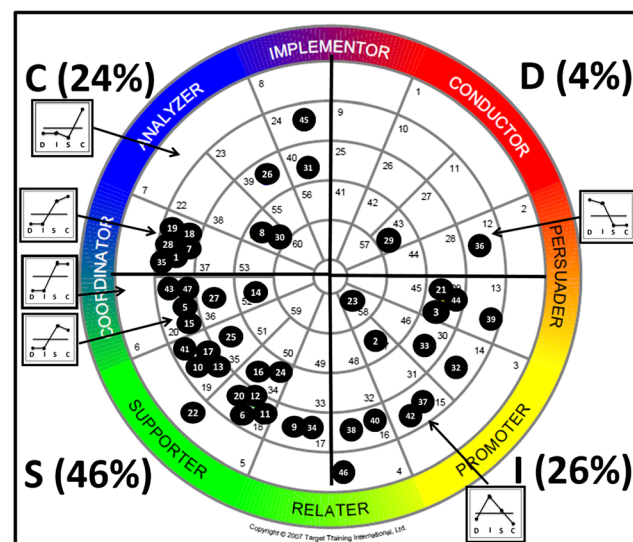

Fig. 3 Behavior data for 47 students presented on the Success Insights Wheel®. See text of description of *insets*. Students 6, 39, 40, 42, and 46 are referred to in text as group D
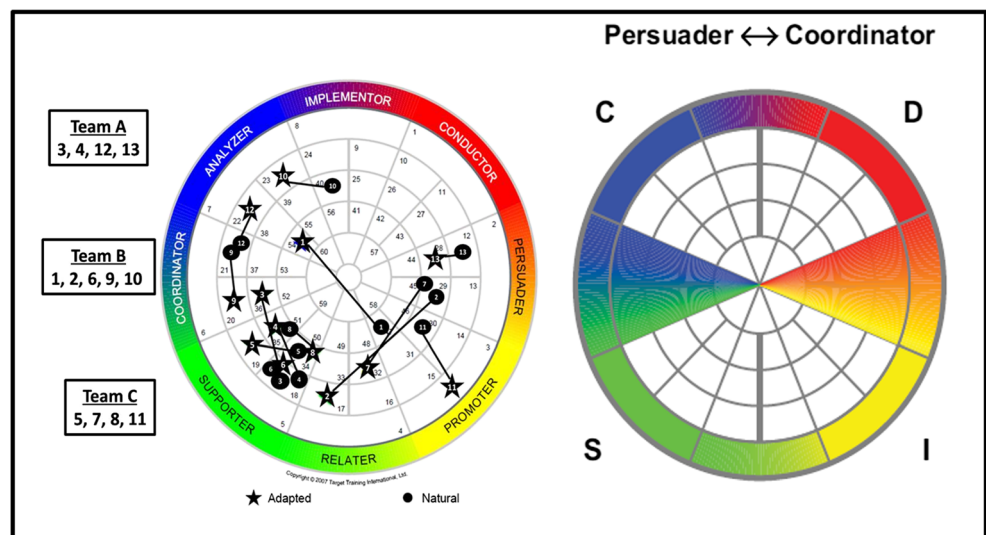
relater, doing what is best for the team, staying on task until the job is complete, and being aware of other people's needs on the team. The next most dominant characteristic is I at 26 %. The high Is are people, persons who will motivate the team. They are creative problem solvers, fun to have on the team, very good team players, natural negotiators because they do not like conflict, and are good at presenting persuasive arguments. Students who have high Cs comprise 24 % of the class. Characteristically, people with C as their dominant characteristic are conscientious; will go the extra mile to get the job done, require objective facts and data; are committed to high quality; questions, criticizes, and tests ideas; and are task-oriented and diplomatic. Only 4 % of the students had D as the dominant characteristic. People with D as their strongest dimension tend to want to direct others. They are driven to win and be on top. Direct and to the point communication is a hallmark of this dimension. They are also generally high-risk takers. As part of our classroom debriefing sessions, we use these data to address a general assumption that we all have a tendency to make, that is, everyone interacts and thinks the same way we do. If we make this assumption, it can result in a breakdown of interactions among group members shortly after the group is formed. Clearly, the distribution of students around the wheel indicates this assumption is grossly incorrect and these differences need to be considered during group interactions.

A specific application of the behavioral information at the group level is provided in Fig. 4. In this figure, the characteristics of 13 members of three teams are illustrated. In class, each team plotted their natural and adapted behavioral styles. The natural style is who a person is when they are relaxed or when they are under substantial pressure because they do not have the energy to adapt their behavior. The adapted style is what happens when a person modifies their behavior to meet the demands from the environment. They will adapt to survive or succeed. When there is significant separation between the adapted and the natural, this can tell us something about the extent to which the student is satisfied with their current situation. Significant differences such as moving from one quarter to another quarter can be an indicator of significant stress. Examples of this may be seen in students 2 and 7 who have both shifted their behavioral style to a supporter. The difference between the adapted and natural for student 1 could be an indicator of significant stress. It could also be a result of being in a new situation and not understanding the behaviors necessary for success.

Each team was provided with some team blending resources. These resources provided details regarding the strengths, weaknesses, problem-solving abilities, communication preferences, and potential areas to avoid for each of the eight general categories. The diagram on the right side of Fig. 4 is an example of a resource that looks at the potential behavioral roadblocks between persuaders and coordinators. The three teams featured have persuaders. For the persuaders on teams B and C, they showed significant adaptation from their natural tendencies. Although this adaptation may have created stress on an individual level, the styles at the team level blended well and the outcome on their final project presentation was around 90 %. In contrast, the adapted and natural styles of the persuader in group A, no. 13, showed little variation. Observations during class indicated that this student was a dominant force in their group and did not adapt well to the other members in the group, which made it difficult for the coordinators in the group to buy in and for consensus to be reached regarding the project research question and final project products. As a result this group had one of the lowest scores on the final presentation. These results will certainly be used to inform future groups about the importance of adaptation.

Fig. 4 Behavioral characteristics for 13 members of three teams, *A*, *B*, and *C*. See text for explanation of natural and adapted data

TriMetrix assessment data—motivational characteristics
The DISC model interprets how we relate and interact with each other. We can choose to modify our behaviors. However, more often, relationship problems in a group result from fundamental differences in our motivational drivers. The top two motivators, which are usually the two most important drivers, for each student in the class are illustrated in Fig. 5. The primary and secondary drivers for each student are plotted in the outside and inside rings, respectively. For the class as whole, 64 % of the students have the theoretical motivator as one of their top two drivers. Fifty-five percent of the students have the aesthetic driver as one of their top two. The social driver is in the top two for 40 % of the students.

Based on their behavioral characteristics alone, one might have expected that the group consisting of students 6, 39, 40, 42, and 46 (group D identified on Fig. 3) to have what is referred to as a good behavioral style match. Both the S- and I-dominated behaviors are people-oriented and share a need for personal warmth and interaction. Although this group was successful in terms of the outcome of their project in that they had a score of 95 %, one of the members who had the higher I (no. 6) was very stressed out by the entire process. The high S students did not see a problem. The higher I student did what they could do to adapt behaviorally. However, at the end of the day, the motivational drivers of this student were fundamentally different from the other four. The four all had aesthetic in their top two motivators and the stressed student had the individualistic motivator as her top driver. It turns out that this student was in a situation that is uncomfortable for those with a high individualistic motivator. Typically, a person with high individualistic tendencies desire to be independent and lead the team. In this group situation, the student was not able to fulfill this desire in that this person felt a lack of control of

their own destiny and that of the rest of the group. So in this case, even though, behavioral adaptation was attempted, it could not overcome the differences in the primary driver.

Group collaboration rubric We used a formative assessment approach to get a sense for how the groups were collaborating about 6 weeks into the project. A rubric for group collaboration (Table 5) was developed based on several descriptions of the characteristics and factors that have been found to be important in quality collaboration (Gosselin et al. 2003; Ashcraft and Treadwell 2008; Social Entrepreneurs 2011). Each group was given time in class to assess their performance responding yes if they accomplished the element (2 points), maybe if they were not sure (1 point), and no if they had not addressed the element (0 points). There are three sections in the rubric. They include team needs and interpersonal and intrapersonal characteristics. Overall scores ranged from 43 to 60 points (Table 6). Most teams indicated that they had accomplished the interpersonal and intrapersonal elements of the rubric. Most of the variability in the overall score came from the team needs section. Analysis of the subscore data from the team needs section indicates that all groups struggled to address the elements in the shared responsibility section followed by those in the communication section. The "shared responsibility" sector analyzed aspects of collaboration that include the decision-making process, establishing expectations of work for each member, and identifying team rules. To some extent, the lowest scores on this section are not surprising in that many of the elements are related to the processes of taking shared responsibility.

Discussion

Applications of a business-based instrument Higher education is being confronted with a paradigm shift (e.g., Arum and Roksa 2011) that is forcing it to collectively reexamine its ability to develop graduates who have the relevant professional competencies. Collaboration and team work are competencies that are sought after by many employers. Through the use of an instrument such as the TriMetrix®, the UNL-ES program is taking a page from the business world and partnering with it to help students understand themselves, adapt their behaviors to more effectively work in a team, and be introduced to the concept of assessments and their use in the professional world. As is the case with any type of assessment instrument, the TriMetrix® has limitations in the context of it being a self-reporting instrument. As outlined in Bedwell et al. (2011), several particular biases can influence self-report measures: consistency motif, social desirability, acquiescence biases, and self-serving biases. A comprehensive discussion of these influences is beyond the scope of this paper, and the reader is referred to Bedwell et al. (2011) and references
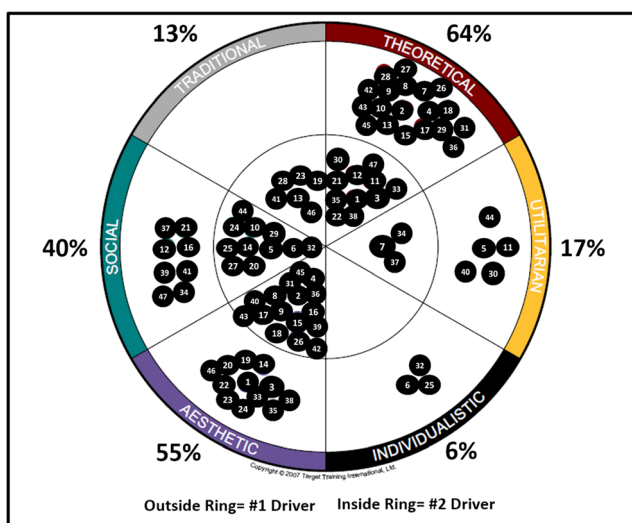

Fig. 5 Motivational characteristics for students on TTI success insights wheel. The primary and secondary drivers for each student are plotted in the outside and inside rings, respectively

Table 5 Collaboration rubric

Characteristics	Elements	Scoring	How would you improve?
Team needs		2- yes 1- Maybe 0- No	
Shared goal/mission/Vision (GMV) (mutual goals)	Developed shared GMV for project that is clearly defined and can be realistically obtained in the project time frame Developed trust as project developed		
Objectives and task (mutual goals)	Identified specific objectives and tasks		
Decision making (shared responsibility)	Defined how team will make decisions and reach agreements-consensus, voting, "1can live with that" Documented how team will show/reach agreement		
Shared expertise and definition of roles (shared responsibility/resources parity)	Used distributed leadership-rotated roles, shared tasks, etc.		
	Identified strengths and weaknesses of individual team members		
	Responsibilities defined and understood by members of the team		
	Established clear expectation regarding the expertise/information/data that each member will develop and provide Set and modified *group* priorities-schedule and workload		
	All participants take responsibility for group outcomes.		
Team rules (shared responsibility/parity)	Established attendance and on-time policy		
	Team agreed on consequences when rules (norms) are not followed Developed guidelines for documenting assignment completion		
	Defined clear expectations of performance		
Communication—established formal and informal channels	Clearly defined plan for communication between meetings including how often Developed agenda and minutes for meeting times		
	Established regular meeting time, duration, and frequency		
Interpersonal			
Mutual respect, understanding, trust (parity)	Team members have played an active role in the group Diverse perspectives and interaction styles are respected		
	Avoided judgement during creative problem solving		
	Evenly divided responsibilities		
Communication	Team members communicated openly, honestly Used active listening skills		
	Managed conflict with effective negotiation skills to develop solutions		
	Acknowledged positive contributions from teammates to the group		
Intrapersonal			
Willingness to collaborate (voluntary)	Demonstrated enthusiasm for working together		
	Set and modified personal priorities, schedule and workload to complete project Demonstrated flexibility to varying ways of organizing and working together		
Responsibility (individual responsibility)	Took responsibility for all *personal* outcomes and contributions to the project		

therein for more details. Because the focus of this application is on behaviors and motivators, the social desirability bias could impact the results. This bias recognizes people's need for social approval and acceptance (through) culturally acceptable and appropriate behaviors (social desirability). This desire may influence individuals to present themselves in a favorable manner, regardless of their true feelings or tendencies to behave in certain ways. The acquiescence bias may come into play as well when respondents generally agree (or disagree) with questionnaires, regardless of the content. This may make some of the dimensions of an assessment seem related, when in fact, they are not.

Table 6 Summary of team self-assessment of collaboration

Group no.	Team need subscores						
	Team needs (36 points)	Interpersonal (16 points)	Intrapersonal (8 points)	Overall (60 points)	Mutual goals (6 points)	Shared responsibility (24 points)	Communication (6 points)
1	28	16	8	52	5	18	5
2	31	16	8	55	5	21	5
3	22	16	5	43	6	15	1
4	29	16	8	53	6	19	4
5	33	16	8	57	6	23	4
6	29	16	8	53	6	17	6
7	36	16	8	60	6	24	6
8	27	16	6	49	6	18	3
9	27	13	8	48	6	19	3
10	27	16	8	51	5	18	4
11	25	15	7	47	5	15	5

Although there are limitations, these are outweighed by the benefits to the instructors. These include a better understanding of how information may best be delivered to students; explanation of the motivations behind student choices; and a framework that helps opens lines of communication in social settings, and classroom interactions. More importantly, students gain additional benefits that include 1. a unique learning experience that helps them better understand their behaviors and motivators; 2. insights that will help them better understand their own perspective as well as others; 3. insights that provide students the ability to communicate their strengths, ideal work environment, and unique personal skill sets; 4. opportunities for teams to get off the ground faster and be more productive because students more clearly see roles, strengths, and potential areas of weakness; and 5. insights into career matching whereby student understand their own strengths and personal attributes that can help them do a much better job of making matches that result in job satisfaction and more productivity. See Gosselin et al. (2013) for the application of these instruments to assessment of professional competencies.

Visible and invisible barriers A person's behavior is the gatekeeper to effective communication. The four dimensional DISC model provides a neutral language that can be used to unlock the gates between individuals. DISC is a neutral language that describes observable behavior. There are no rights or wrongs in terms of the DISC description. The language only describes similarities and differences in how people approach problems, influence people, and react to change, and respond to procedures. As a neutral language, it can be considered as boundary object in that it serves as the interface between individuals who view and interact with the world in very different ways. By recognizing the differences between individuals, it allows them to adapt to each other and to use an analogy become more effective dance partners, more quickly. Without this behavioral information, the students would be essentially "shooting in the dark" (Bonnstetter and Suiter 2013), when it comes to their interactions with each other. This, in turn, reduces the effectiveness of their ability to work as a team. Anecdotal information from observing and listening to interactions among the groups during class reveal that students use the information provided by DISC and take it seriously as they work and adjust to each other, especially in the early stages of group development.

A person's internal motivators provide the reasons why people do what they do and can strongly influence the group dynamic. The motivators provide the arena for communications and will strongly influence the extent to which a person will react both positively and negatively to what is going on. We can all think of times when no matter how we tried to adapt to the other person's communication style, we could not do it. This was the case for group D. The team member with the individualistic motivator as their primary driver was really challenged by the group, yet they were successful in the end. For the other groups, the differences in and among their motivational drivers did not appear to impact the success of their groups.

Collaboration Although many of the students as individuals on the CMA struggled with the importance of developing shared vision for collaboration, in the group setting, they were able to operationalize the concept as indicated by the generally high scores on the mutual goal subscore. Operationalization of the concept is also influenced by the amount of time they invested with each other between the CMA and the group self-assessment. This supports the use of multiple assessments of different types to determine the extent which the students

are able to apply the concepts. A couple of the groups, specifically group 3, struggled with the communication parts of this subscore. It should be noted that the elements in this subscore are related more to process and planning communication than it is to the actual ability to communicate between each other. It is suspected that most of the students have never had to develop an agenda, take minutes, or think explicitly about the length and duration of meetings they have had in the past. In contrast, the high interpersonal scores suggest that the groups have a high degree of confidence that they were effectively communicating with one another.

Recommendations

Assessments typically used in the business world can play a positive role in the dynamics of student working groups. The analyses of these data for this class have informed us about how to improve the use of the assessment output in class. Specifically, we can use these data as specific examples in debriefing future classes. We have also potentially identified certain mixtures of behavioral styles and motivational drivers that may be problematic to group work.

Many students have experienced team projects. However, most students have not explicitly had to learn about the factors that go into effective collaboration or they have never been explicitly explained to them. This is particularly the case with regard to processes of developing shared responsibility. It is also suspected that most of the students have never had to develop an agenda, take minutes, or think explicitly about the length and duration of meetings they have had in the past. In contrast, the high interpersonal scores suggest that the groups have a high degree of confidence that they were effectively communicating with one another. We will definitely spend more time on and give more explicit examples of these aspects of collaboration in the future. One additional item we will add to the assessment package for this class is to have the students compare and contrast their teamwork experiences in this class to other classes they have had in order to evaluate the extent to which the application of the business assessments have had an impact on their perceptions of collaborative teamwork.

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