



Faculty Perceptions on Undergraduate Engineering Education in First-Year Engineering, Physics, and Mathematics Courses

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Abstract

Examining the perceptions of first-year undergraduates and their instructors can provide insight into these students' experiences and shed light on the emerging issues of student attrition and lack of preparedness for the workforce.¹⁻³ Students' perceptions about introductory courses have been examined in previous work.⁴ On the other hand, as the high rate of university student dropouts has frequently been attributed to the poor quality of teaching in first-year undergraduate courses, this study aims to investigate the perceptions of faculty members instructing first-year undergraduates.⁵

Our analysis results in several emergent themes, which include (1) instructor's beliefs about Project-Based Learning as a teaching practice, (2) instructor's level of abstraction when talking about students, (3) instructor's affect towards students, (4) value instructors place on one-on-one interactions with students, (5) instructors' perceptions of their role in development of student motivation and interest toward their courses, (6) instructors' perceived ability to impact students, (7) overall teaching goals, and (8) instructors' motivation towards teaching. From analysis of these emergent themes, there appear to be two distinct instructor groups. These groups, which we will refer to as *Personal Coaches* and *Group Ushers*, are observed to have different attitudes and expressed behaviors towards teaching and their students. These findings are important as they shed light into one aspect of undergraduates' experience, that of faculty support in students' academic development.

The implications of these findings have a profound effect on how we educate the next generation of our national workforce and particularly STEM professionals and we suggest further investigations in this direction. Understanding faculty perceptions is a key step to affect STEM educational reform.

Introduction

Recent publications, including two reports by the *U.S. Department of Commerce* and *U.S. Congress Joint Economic Committee*, project an increase in demand for STEM-skilled workers over the next decade.¹⁻² It is projected that between 2008 and 2018 STEM jobs will grow 17.0 percent as compared to the projected 9.8 percent growth of non-STEM jobs.¹ However, with high attrition rates of undergraduates from STEM programs, there is a concern that universities are not graduating enough students to fill these positions.² A recent study reports that of all STEM majors in the U.S. that enrolled in a 4-year college or university in 2003-2004, only 63 percent graduated with a bachelor's degree within 6-years.⁶ However, student attrition is not the only concern. Some believe that even among the students graduating with bachelor's degrees, many are not prepared to tackle the technical challenges of the 21st century.³

In an effort to engage and better prepare students for the growing challenges of the 21st century, many instructors (and institutions) are turning towards non-traditional pedagogical and curricular

practices.⁷⁻⁹ One such practice that has gained popularity over the last two decades is Project-Based Learning (PjBL). Recent studies demonstrate PjBL to be an effective tool in reaching improved students' learning outcomes and satisfying the needs of industry.⁸⁻¹⁰

Interestingly, although popular among practitioners, there is no agreement about definition of this construct. Therefore, for the purposes of this investigation, we define PjBL using the integrated framework of Blumenfeld *et al.* (1991), Heitman (1996), Morgan (1996), and Perrenet *et al.* (2000) as follows:

*PjBL places emphasis on the application of knowledge over the learning of theory through one or more overarching projects. These projects often address real-world problems and are likely to have an interdisciplinary component and a group work orientation. To encourage student engagement in and ownership of the learning process, faculty act as guides, supporting acquisition of content knowledge and providing project scaffolding, while students exercise autonomy by carrying out independent open-ended projects. Students participating in projects create one or more significant tangible deliverables, often derived from the scaffolding provided by the faculty, but ultimately intended to reflect the knowledge and skills gained through project work.*¹¹

Clearly, this construct is complex; as such, many institutions and instructors use a modulation of PjBL by either reducing the temporary scope of the projects or utilizing a few but not all of its aspects (for example, Heitmann (1996) differentiates project-oriented studies from project-oriented curricula based on the length and integration of the projects into the main subject.) However, simple inclusion of PjBL elements or, for that matter, other effective pedagogical practices in an institutional toolkit does not make a program or a specific classroom successful; of critical importance in such programs and classrooms are the instructors' epistemologies or underlying personal beliefs about teaching and learning. Research has shown that teaching approaches are strongly influenced by teacher's underlying beliefs.¹² Instructors' attitudes and expressed behaviors create an educational context, which has a significant impact on students' engagement and learning outcomes.¹³

This investigation aims to explore both (1) the fundamental beliefs of instructors and (2) the ways in which these fundamental beliefs affect instructors' teaching practices. A framework is proposed relating instructors' fundamental beliefs to their attitudes and expressed behaviors towards teaching and their students. Integrating this framework with the results of other investigations (for example, Cotten & Wilson, 2006; Astin, 1993; Kuh *et al.*, 2006; Brewer, 2005; Small, 1996; Barr & Tagg, 1995; Magno, 2007; Czubaj, 1996) this paper offers a set of insights for instructors and institutions alike.

Methods

This investigation is part of a larger multi-site, mixed-methods study focused on first-year engineering students' experiences in introductory engineering courses whose environments range from traditional to PjBL. In this paper, we focus on one of the sites, a small technical undergraduate institution with a strong PjBL component within its curricular structure.

Interviews with nine instructors (2 women and 7 men) in three introductory level courses - mathematics, physics, and engineering - were performed using semi-structured open-ended protocol, which included questions about instructor's pedagogical practices, teaching challenges / highlights, motivation for teaching, and interactions with students. Grounded theory was used to analyze pseudonymized interviews with a goal of discovery of underlying themes and ensuing overarching theoretical framework.¹⁴ Thus, interviews were read for general trends across all participants and a set of emerging categories was identified for further data coding.

The codebook was further refined through a process of open-coding followed by constant comparative coding practice to hone a set of more refined codes that allow for a more granular understanding of the emerging themes. The codebook validity and reliability was confirmed through multiple passes of coding by two coders and checking for 'inter-coder reliability,' a quantification of the agreement between the two coders. For this study, once an inter-coder reliability rating of 95% was achieved, data analysis was completed by coding all of the faculty interviews.

The coded quotes were then organized into matrices and emergent themes were identified through the analysis of the quotes found for each code. The relations between the emergent themes were mapped, which allowed for the development of an emergent theoretical framework.

In what follows, we draw from pseudonymized interviews to present a set of representative quotes is used to demonstrate the general themes and emerging trends; additionally, the resulting theoretical framework is presented.

Results and Analysis

A. Emergent Themes

Our analysis results in several emergent themes, which include (1) faculty beliefs about Project-Based Learning as a teaching practice, (2) instructor's level of abstraction when talking about students, (3) instructor's affect towards students, (4) value instructors place on one-on-one interactions with students, (5) instructors' perceptions of their role in development of student motivation and interest toward their courses, (6) instructors' perceived ability to impact students, (7) instructors' overall teaching goals, and (8) instructors' motivation towards teaching. Each of these themes was investigated and two groups with opposing viewpoints were discovered within each theme. Later, a framework was developed that explored the inter- and intra-group commonalities and differences within each of the eight themes.

Theme 1: Faculty Beliefs about Project-Based Learning (PjBL) as a Teaching Practice

Despite the fact that the institution's curriculum has a strong PjBL component and all nine faculty members incorporate some level of PjBL into their courses, we find a clear discord between their beliefs about effectiveness of PjBL as a teaching practice. To highlight this divide, we use the definition of PjBL presented in the introduction.

Using this construct, seven faculty members are found to be aligned with the institutional support of PjBL teaching practices. These individuals both express their own personal preference for

PjBL-based teaching practices and describe the benefits student's gain from this type of learning environment, usually citing their feelings that PjBL better prepares students for the workforce. As an example, in the following quote faculty member Bethany Lee describes her own personal preference for PjBL and its influence on her job search:

Upon completion of my degree I was looking at various positions, some post-doctoral positions... Uhm, visiting assistant professor position at [this institution] and one of the things that impressed me...about [this school] was the Project-Based Learning component, where projects are incorporated early on into the students' learning and so that was definitely the first point of interest.

- Bethany Lee, Physics Faculty

In addition to these seven faculty members, two are found to have epistemologies that conflict with the PjBL-based institutional culture. Interestingly, these faculty accept the necessity of using PjBL in their classroom because of the institutional ethos. Additionally, they see the benefits of PjBL in certain contexts but do not feel that it is useful for in their classrooms. In the following representative quote, a mathematics faculty member discusses the disparity between her own teaching preferences and those dictated to her by the institution:

I will admit I do a lot more ProjectBased stuff because of the dictate which is fine. Obviously uh it's simply my own preference that I veer towards the other way...

- Diane Troy, Mathematics Faculty

Theme 2: Instructor's Level of Abstraction When Talking about Students

When prompted to talk about students, instructors' discourse clearly segregates into two distinct groups, "individualists" and "generalists." More specifically, seven "individualist" instructors share specific interactions/series of interactions about individual students or student groups. Their discourse illustrates clear connection to individual students, knowledge about individual students' attitudes and behaviors, and a sense of care about individual students' well-being, academic and otherwise. The language used by "individualists" when discussing students includes specific identifiable nouns and single pronouns (i.e., he or she) evoking clear images of their individual students. For example, Neal Thomas describes working with one of his students in the following way:

A particular woman student I'm thinking of...when she came in the door the first time she had very unrealistic expectations...and we explained to her that...it wasn't possible to get [the parts machined] that day, and if we had to make the entire assembly she was asking for it wouldn't be that year...and later, she came back and she said "Well alright, I understand you can't do this, but I need to do it, so teach me how." And she demanded to be taught how to do it. And she finished her project a term early and we hired her to help make other people's parts the following term. And she had never seen a machine tool before. And she was not a mechanical engineering student, she was a biomedical student.

- Neal Thomas, Mechanical Engineering Faculty

On the other hand, the discourse of two "generalist" instructors in the second group consists primarily of abstraction and broad generalizations about the students at their institution or in their courses; these sweeping statements are seldom supported with specific evidence. The student groups described by "generalists" are rarely smaller than the size of their class. In comparison to the discourse of "individualists," the "generalists" use noun categories (e.g., first-year students,

physics majors) and a broad group name “students,” as well as the plural pronoun “they.” The “generalists” use very little in the way of evidence, have a more universal view of students, and show very little individual connections with students. An example of one such broad generalization can be seen in the following quote:

[Here] students tend to come out weakly prepared in their basic science and mathematics
- Thomas Peterson, Physics Faculty

Theme 3: Instructors' Affect towards Students

In addition to being set apart by the level of abstraction in their discourse about students, the instructors are also clearly divided in their affect towards students. Seven instructors display predominantly positive affect (PA) towards students while the other two display predominantly negative affect (NA.)

The PA faculty describe their students as good, motivated, proactive, and hard-working. Although acknowledging difficulties and weaknesses that individual students in their classes may have, the PA faculty also stress the positive characteristics that those same students exhibit. The language used in the PA faculty's description of students seems to indicate the empowering function these instructors have in their classrooms and their belief in students' success. For example, Bethany Lee describes one of her students in the following way:

One year there was a woman who was very good, very proactive about asking her questions... there were some guys who teased her about it...but she didn't let it interfere...she just fired away and I thought that was great, like all the power to you!
- Bethany Lee, Physics Faculty

In comparison, the NA faculty depict the student population as having some significant weaknesses, lacking in basic knowledge, and being unmotivated. Although they acknowledge the strengths of some students, the language used by NA faculty focuses primarily on students' overall weaknesses. For example, one instructor shares his view of the student population in the following way:

If they're in [this Physics course] they've had at least a half year of high school calculus and they probably have never had to work hard in their lives.
- Thomas Peterson, Physics Faculty

Interestingly, the positive affect towards students is primarily displayed through specific examples about individual students while the negative affect was primarily exhibited through broad generalizations. In other words, we find a high correlation between “individualists” and those with predominant positive affect towards their students, as well as a high correlation between “generalists” and those with predominantly negative affect. These correlations are later explored when developing our framework.

Theme Four: Value Instructors Place on One-on-One Interactions with Students

Another distinction between instructors was the value they place in their one-on-one interactions with students. Six instructors describe the great value they find in one-on-one interactions and demonstrate the ways in which they attempt to increase the frequency and quality of their interactions with individual students. Not only do these faculty describe the value of such

interactions in the students' academic and personal growth, they also find interactions with their students to be rewarding for themselves. As such, these faculty actively seek out opportunities to further work with individual students or student groups. This may be indicative of a great value these faculty place in the students' holistic development and potentially in their own professional development. In the following example quote, when discussing teaching challenges, faculty member Jeffrey Cohen highlights his frustration when he is not able to give students as much individual attention as he would like:

The more students there are in a class the less time there is to actually give each one the attention that they deserve or I would like to give to them. So that's one frustration.

- Jeffrey Cohen, Mechanical Engineering Faculty

Yet three instructors' discourses seem to indicate either indifference to or little placement of value in one-on-one work with students. Some of these instructors acknowledge a paucity of individual interactions with students and seem to attribute this to students' inactivity or lack of initiative. There is a clear dearth of descriptions of these instructors' role in initiating and sustaining such interactions; rather, they seem to take up or prefer a passive role in these activities. We hypothesize that this lack of faculty-driven initiative to originate and support student-faculty interactions may be indicative of faculty perceptions of some limited value in these interactions or no value at all. What is clear from our analysis is that these instructors perceive that they play hardly any role in honing such relationships, whatever their merit may be. In the example quote shown below, a physics faculty member identifies a lack of individual interaction with students but does not express any discontent or desire to increase such interactions:

They really don't interact with me at all. I mean they're there doing group work and I'm, I'm not quite sure, and I'm there, I will answer questions. They don't have questions for me.

- Thomas Peterson, Physics Faculty

Theme 5: Instructors' Perceptions of Their Role in Development of Student Motivation and Interest toward Their Courses

When discussing student motivation and interest towards their courses, instructors also express two sets of distinct views. Many of them describe the active role they play in promoting student motivation and interest in their courses. Examples of teaching practices used by such faculty include the use of group work and projects, as well as the presentation of multiple applications of theory to practice. Even when these instructors report a lack of motivation or interest on the part of their students, they view this problem as fixable and discuss the ways in which they attempt to solve students' lack of motivation. In the representative quote below, a mathematics faculty member discusses his methods for increasing student interest:

I think of little gimmicks, driving in or something and saying, "Oh wouldn't that be neat," or something to amuse them. I think that this is fun and approachable stuff uh. Other times, I don't know. I um I'm hoping that sometimes my own passion for some of the material will carry across.... if I don't get excited about something uh and you can't keep this constant excitement going on. It has to be moments in the classroom.

- John Pinkard, Mathematics Faculty

In contrast, other faculty view student motivation and interest in their courses as a static

construct, independent of their teaching. In other words, in their discourse these instructors' place the responsibility for motivation solely on the students. These faculty describe the students as either motivated or not, a quantity that seems to be fixed for each individual student or student group. In the representative quote below, a mathematics faculty member discusses student's lack of motivation:

That's the difference between [College X] and here. It's not the professors. I've taught at...a community college....Exact same syllabus...nothing was different. Exact same calculus syllabus. ...So those kids are getting the exact same material as here and I'm sure...betcha exact same syllabus as [College X]. So what's the difference? It's the students it's not the professors because the professors can teach at any of those schools and they do like me.....It's how motivated the kids are to do what they want to do.

- Diane Troy, Mathematics Faculty

Theme 6: Instructors' Perceived Ability to Impact Students

Examination of all nine interviews reveals that six instructors demonstrate a drive to have a significant, positive impact on students. In addition, these faculty describe a strong conviction that they are, in fact, able to bring about a positive change. In the quote below, when asked what his favorite part of teaching is, a mathematics faculty member expresses that exciting students and having an impact on them is his favorite part of teaching:

My very favorite part [of being a professor] is...thinking I'm having an impact on students. You know, that's what gets me up in the morning and [I] say, 'How am I going to excite somebody about this today?'

- John Pinkard, Mathematics Faculty

While most instructors do express this desire and ability to have a positive impact on students, three instructors appear to be silent on the subject. Although not necessarily indicative of a lack of desire or confidence in their ability to do so, the absence of the discourse on the topic is a significant finding in and of itself.

Theme 7: Overall Teaching Goals

Another emergent theme apparent in our analysis is that of faculty's overall goals when approaching the art of teaching. As before, we find a bifurcation of instructors' narratives within this theme. Six instructors describe their role in the classroom to go far beyond the course's content; these faculty elucidate the ways in which they feel they significantly impact students as learners. They aim to teach their students study skills, improve their ability to think on their own, and develop into integrative thinkers prepared for the real world environments that extend far beyond college classrooms. In the representative quote below, a physics faculty member discusses the various skills she wants her students to develop and her role in supporting this development:

...there are all these tools that we develop not just as physicists but as engineers and scientists. And ... there's a way of thinking about these problems; so you know the content is one aspect but the skills that you develop as a scientist to... think coherently and ... critically and to not accept things right away but to understand why they are the way that they are. This is one of the goals that I'm trying to accomplish or just kind of help the students see that it's an integral part of their learning.

- Bethany Lee, Physics Faculty

Three other instructors describe their overall goals in terms of course content; these faculty portray their role as that of imparting course-related knowledge and preparing students for future courses/curricula. The scope of their perceived impact on students is limited to the students' future academic experiences. In the representative quote below, a mathematics faculty member discusses the content he wants students to have in order to be prepared for their next math course:

I want them to be prepared for whatever next course they'll be taking and the end of this course deals with vectors and everything necessary for the multi-variable calculus they'll be doing next term.

- John Pinkard, Mathematics Faculty

Interestingly, our analysis indicates that the instructors' epistemic views on the goals of teaching seem to segregate, for the most part, along the lines similar to those of 'individualists' and 'generalists.' In other words, we determine a positive correlation between 'individualist' instructors and those who find their goals to be more holistic in terms of student development; we also observe a fairly positive correlation between those faculty who share 'generalist' views and those who describe their goals solely within the context of their courses' content.

Theme 8: Instructors' Motivation towards Teaching

Our findings indicate that instructors' discourse about their motivation toward teaching also falls into two distinct categories. Six instructors describe their drive to teach in terms of a desire to share knowledge with their students. These instructors view teaching as their life calling, and frequently mention their love of teaching and positive affect towards students. In the quote below, a physics faculty member discusses her motivation for teaching:

Ever since I was a little girl I would always play school with chalkboards like [I] kind of knew that I loved teaching...this is something that I wanted to make a career out of...once I was granted this position it felt like the most natural thing to do to move into teaching a subject that I really am passionate about and want to share with my students.

- Bethany Lee, Physics Faculty

Bethany Lee's passion and enthusiasm for teaching is apparent. She directly mentions wanting to share her subject with her students.

Three instructors are more pragmatic about their choice to teach, talking about the college's location or focusing on their need for a job. In the two example quotes shown below, Diane Troy explains why she teaches at this institution:

When I came [to my home town] finally and I needed a job and looked in the [local newspaper], [I] said, "Hey I can teach college...I've taught everything else!" So I came [here]...

I like my job because of how much flexibility...because of what I get out of it....the benefits are great. I get great vacation time...it just suits my lifestyle where I can go to China for the summer or Pakistan for the summer...whatever the heck I want to do...the flexibility this job gives me asa teacher is great ...And since...I'm not supporting anybody but me...not worried about the money. I'm not ... you know I don't get professorial salary but I get plenty for myself.

- Diane Troy, Mathematics Lab Instructor

Diane Troy doesn't mention a passion for teaching, or an interest in the subject. Her motivation for teaching is not focused on the students, but rather on the benefits she receives.

B. Theoretical Framework

Our analysis suggests that within each of the emergent themes described above, instructors' discourse falls into one of two distinct groups with the faculty membership more or less consistent across all themes. While there are some exceptions to the distribution of the faculty within these two groups, our data indicate emergence of only these two explicit groupings. Figure 1 below illustrates the attitudes and expressed behaviors corresponding to the eight themes characteristic of each group's members.

Faculty in Group A	Theme 1: Implement and believe in effectiveness of PjBL practices
	Theme 2: View students as individuals
	Theme 2: Share specific examples of interactions with students
	Theme 3: Display positive affect towards students through specific stories
	Theme 4: Value 1-on-1 interactions with students/try to increase their frequency
	Theme 5: Believe that they play a significant role in motivating students
	Theme 6: Believe that they can significantly impact their students in positive ways
	Theme 7: Describe their goal as that of preparing students for the real world
Theme 8: View teaching as their life calling	
Faculty in Group B	Theme 1: Implement but do not believe in effectiveness of PjBL practices
	Theme 2: View student body as a whole
	Theme 2: Use broad generalizations when talking about students
	Theme 3: Display negative affect towards students through broad generalizations
	Theme 4: Indifferent to or place little value in 1-on-1 interactions with students
	Theme 5: Believe that student motivation is static and purely student-driven
	Theme 6: Do not express the desire or ability to significantly impact their students
	Theme 7: Describe their goal as that of preparing students for future courses
Theme 8: View teaching as a job	

Figure 1. Faculty attitudes and behaviors characteristic of members of each group. Each set of attitudes/behaviors corresponds to a distinct emergent theme describe above..

Based on these findings, we present a framework, shown in Figure 2 below, which demonstrates the inter-thematic connections, i.e., connections between the attitudes and expressed behaviors within each distinct group of instructors, and draw the comparison between the two groups. Our framework refers to the two emergent groups as the *Personal Coaches* and the *Group Ushers* (Jonathan Stolk, personal communication, Fall 2012.) Importantly, through our framework we posit that it is the first emergent theme (faculty epistemic views about effectiveness of PjBL as a teaching practice) that is at the core of each of the two groupings, as described below.

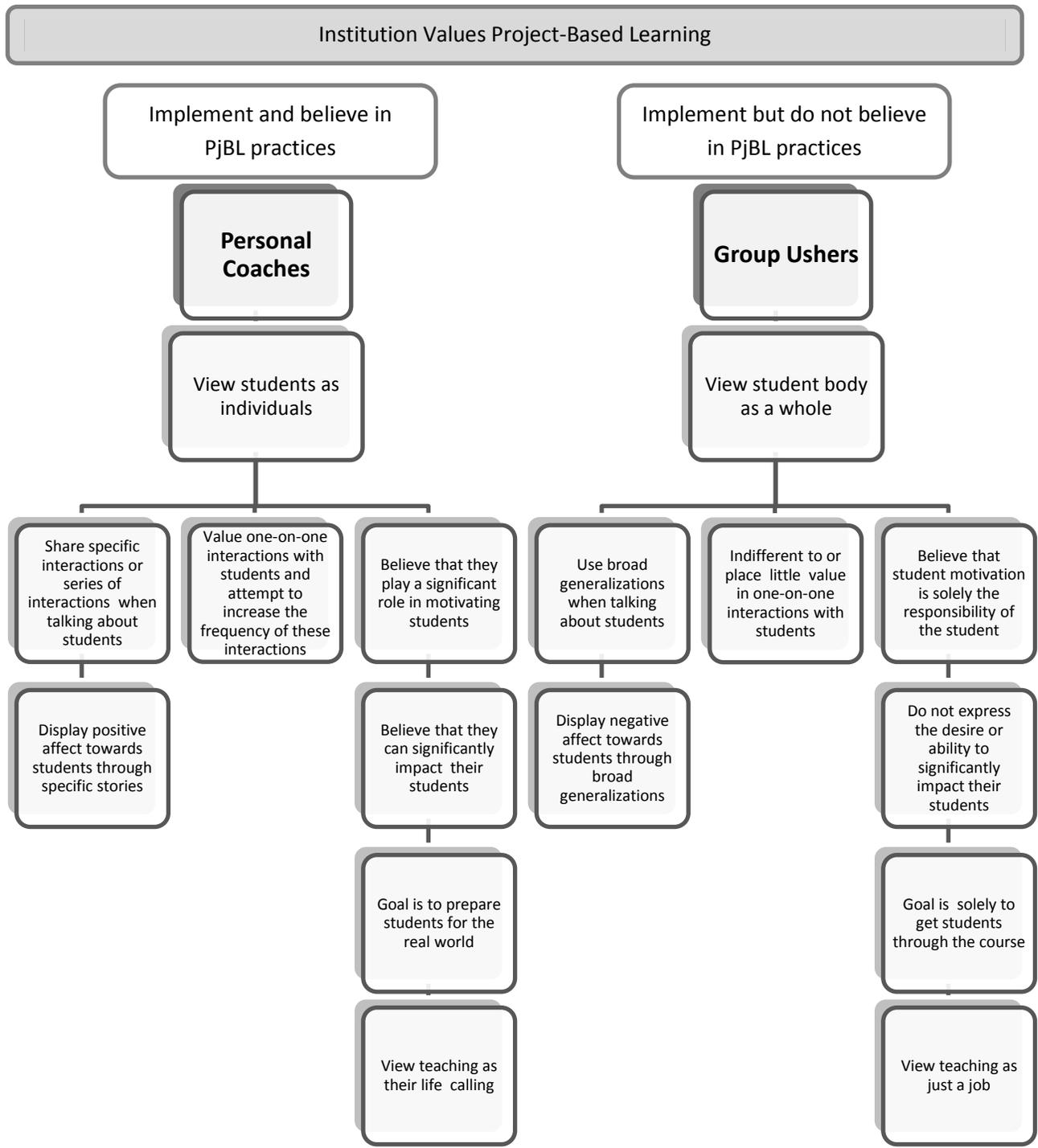


Figure 2. An outline of the connections between the attitudes and expressed behaviors of the two distinct groups of instructors, Personal Coaches and Group Usher.

We have identified a range of faculty attitudes and expressed behaviors towards teaching and their students. Our analysis highlights the ways in which faculty, through their discourse, position themselves with respect to students and further orient their action towards the students.

Using the construct of PjBL presented in the Introduction, we propose that central to this positioning and the ensuing framework is the instructors' belief or disbelief in the benefits of the PjBL practices they are implementing. This suggestion is based on the fact that PjBL environments by their nature originate from student-centered, student-driven, and faculty-supported practices. The emerging framework outlined in Figure 2 above is therefore rooted in the notion that a major driver of faculty attitudes and behaviors towards their students and overall teaching is the position they take with respect to the PjBL and students, i.e., "individualist" or "generalist." The instructors that take an "individualist" stance towards their students seem to acknowledge their active role as *Personal Coaches* in their students' development. On the other hand, a less prominent group of faculty take a "generalist" position suggesting that the students can be viewed as a group that is more or less static with respect to the motivational development and personal growth. Importantly, these faculty's discourse indicates that a change in students' behaviors, motivational stance, and attitudes toward learning is beyond their authority, thereby allowing for a more or less passive role of *Group Ushers*.

Personal Coaches

In their discourse, *Personal Coaches* primarily use the individualist language, speaking about specific students and often referring to individual students by name. When discussing their teaching practices, these faculty use a narrative approach which reflects their "individualist" tendencies, describing their individual interactions with specific students and clearly cherishing each and every one of these interactions. Within these stories about individual students, *Personal Coaches* demonstrate predominantly positive affect towards students and the overall practice of teaching.

Personal Coaches place value in one-on-one interaction with students, and actively seek out opportunities to increase the frequency and quality of these interactions. In attempting to increase these interactions, *Personal Coaches* often focus on creating a supportive and comfortable environment for students in their development. The proactive stance that *Personal Coaches* take in their discourse is further demonstrated in the way in which they describe the direct impact they have on students in many different arenas. Ranging from a discussion of their personal teaching philosophies to their positioning towards development of students' motivation to their active role in preparing students for life beyond their individual courses and even beyond the college, *Personal Coaches* describe their teaching as a life calling. Finally, this group of faculty is found to be teaching predominantly through the PjBL environment, which calls for more individualistic approach to students and teaching.

Overall, we propose that the *Personal Coaches*' individualist approach is affected by their belief in PjBL as a teaching practice. Furthermore, the "individualist" approach has a significant impact on the way instructors perceive their role, their responsibility towards their students, and their ability to impact their students. These instructors see students as individuals, and accordingly perceive that they are able to impact students' long-term goals and experiences.

Group Ushers

Group Ushers take a "generalist" stance in their approach towards students and their overall teaching. *Group Ushers*' discourse is characterized by broad generalizations and abstraction when discussing students and pedagogical practices. *Group Ushers*' language often exhibits signs of predominantly negative affect towards students.

In their discourse *Group Ushers* place little to no value in one-on-one interactions with students and, moreover, these instructors take a passive stance towards developing and honing such interactions. This passive stance that *Group Ushers* take in their discourse is further demonstrated in the paucity of discussion of their impact on their students. The *Group Ushers'* teaching philosophies, positioning towards development of students' motivation, perception of their role as bounded to imparting course content, absence of the discussion of their value in affecting students' trajectories, and "teaching as a job" attitude are all associated with traditional pedagogical approaches.

Conclusion

Our framework proposes two groups of faculty, whose attitudes, expressed behaviors, and teaching practices, seem to be driven by their "individualist" or "generalist" positioning toward the students. This individualist or generalist positioning is in turn influenced by whether or not instructors believe in the PjBL practices which they implement. We propose that the approach to teaching taken by *Personal Coaches* is of significant benefit to students. This proposition is grounded in literature which suggests that many of the attitudes and behaviors that are found to be associated with the *Personal Coaches'* have a positive impact on students' learning outcomes.

Personal Coaches' preference for the PjBL learning environment is aligned with positive learning outcomes for students, as we delineated in the Introduction. The positive affect towards students displayed by *Personal Coaches* has been known to have a positive influence on student outcomes. Instructor personality, presence, and overall attitudes have been found to affect students' willingness to interact with instructors which in turn has been found to have a significant positive effect on student outcomes including student retention, academic performance, and social development.¹⁵

Personal Coaches' valuing of one-on-one interaction with students is of importance as individual interactions with instructors have been connected to student learning and development, satisfaction with instructors, GPA improvement, degree attainment, graduation with honors, and enrollment in graduate or professional school.¹⁶ Informal interactions with instructors also have been positively correlated with positive perceptions of the university environment, personal growth in the areas of leadership, social activism, intellectual self-esteem, and academic as well as social self-concept.¹⁷

Personal Coaches also believe that instructors play a significant role in developing and supporting student motivation. Much controversy surrounds the topic of responsibility for student motivation.¹⁸ However, one of the major findings in this area came in a 1996 study by Ruth Small, which found that students perceived instructors as having the prime responsibility for learners' interest or boredom.¹⁸⁻¹⁹ Controversy aside, instructors' attempt to motivate students will likely lead to more positive outcomes than leaving the motivational development solely in the hands of the student, and certainly leads to a greater connection with students.

Individuals who are focused on preparing students for the real world are categorized as *Personal Coaches* as opposed to the *Group Ushers* whose primary focus is to deliver the content that

students will need for their next course. This disparity is similar to the disparity between the “Learning Paradigm” and “Instructor Paradigm” presented in Robert Barr and John Tagg’s *From Teaching to Learning: A New Paradigm for Undergraduate Education*.²⁰ Barr and Tagg (1995) highlight the importance of the “Learning Paradigm” which produces learning by creating powerful learning environments that result in the achievement of demonstrated knowledge and skills. This is in comparison to the “Instructor Paradigm” which provides instruction through offering courses/programs and results in the accumulation of credit hours. Throughout their paper, Barr and Tagg emphasize the benefits of transitioning from the “Instructor Paradigm,” which seems to resonate with the *Group Ushers’* approach, to the “Learning Paradigm,” that seems to be related to *Personal Coaches’* approach to teaching and learning.²⁰

Additionally, the positive effects of *Personal Coaches’* belief that their teaching could have a significant impact on students is well grounded in recent findings that instructors with high efficacy provide a greater academic focus in the classroom.²¹ From an institutional perspective, instructor efficacy has also been related to persistence on a task, risk taking, and use of innovations.²¹ These instructors are also motivated to teach primarily because they genuinely love the profession. Instructor motivation and passion for teaching has been linked to increased student interest in learning and acquisition of content.²²

Based on this evidence and using our framework, it is clear that in terms of student outcomes, *Personal Coaches’* approach to teaching and learning is preferable over that of *Group Ushers*. In order for both instructors and institutions to benefit from these findings, it is important to not only highlight the benefits of *Personal Coaching* but also to provide and utilize opportunities for professional development that allow faculty to shift away from the *Group Usher* strategies towards *Personal Coaching*. These opportunities should include targeted training in the PjBL pedagogy and workshops on classroom discourse. In addition to helping instructors with the implementation of PjBL, these workshops may reaffirm the institutional support for PjBL; it has been shown that faculty who perceive educational innovation support at the institutional level are more motivated and persistent in the use of innovative practices.²³ If made aware of the benefits of an “individualist” approach, more instructors might become more aware of their “individualist” or “generalist” positioning towards their students. Finally, instructors should be educated about the benefits of PjBL. If instructors who implement PjBL understand its benefits, they may be more likely to embrace PjBL as a teaching practice.

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