Identifying the breakdowns in how students and faculty interpret course objectives

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Abstract

Because students and professors place different values on syllabi components, perceptions of course objectives vary. Previous studies investigated the relationship between students' and instructors' expectations and syllabi content, but do not address the role of explicitly stated course objectives in syllabi. Our study used qualitative methods to investigate relationships among student-reported perceptions of course objectives, professor-reported intended course objectives, and explicitly stated course objectives from syllabi. We used interviews from two professors who taught introductory biology courses for non-majors, course syllabi, and student responses to an open-ended questionnaire about course objectives. After using a deductive approach to code students' responses, we found only 21% of students accurately identified a course objective listed in the syllabus. We identified three main themes in student reported course objectives: Knowledge (n=539), Practice (n=30), and Performance (n=41). Two of these (Knowledge and Practice) aligned with professor intended course objectives but did not align with explicitly stated course objectives. Based on our findings, we conclude that students poorly identified explicitly stated course objectives but correctly identified their professors' intended objectives. Therefore, we recommend professors better connect their intended course objectives with those explicitly stated in the syllabus.

Keywords: Syllabus, course objectives, communication, undergraduate biology

Introduction

A traditional communication tool between students and professors is the course syllabus. Syllabi serve as a classroom contract between students and professors by presenting professor expectations, assignments, and anticipated learning outcomes (Griffith et al., 2014). However, students and instructors value different syllabi components, making syllabi alone an inadequate communication tool (Becker & Calhoon, 1999; Smith & Razzouk, 1993). Defective communication via syllabi highlight disconnections between teachers' and students' interpretations of course objectives (Aggar & Shelton, 2015; Mitchell & Manzo, 2018).

Traditionally, syllabi fulfill one or more of four primary roles: as a contract, a permanent record, a learning/teaching tool, and/or a communication medium (Albers, 2003; Parkes & Harris, 2002; Thompson, 2007). As contracts, syllabi present expectations, rules, and responsibilities to which faculty and students are expected to adhere (Matejka & Kurke, 1994; Parkes & Harris, 2002), as well as act as a permanent record of teacher performance by documenting the scholarship of the course, course concepts, expectations for students, and evaluation techniques (Albers, 2003; Parkes & Harris, 2002). Documentation of course content through syllabi can assist administrators or reviewers in determination of a course's alignment with a department and/or institution's mission (Albers, 2003). Instructors design and use syllabi as learning/teaching tools to motivate students and positively influence their attitudes (Bain, 2004; Parkes & Harris, 2002). When used as a learning/teaching tool, syllabi place increased emphasis on resources and practices students can utilize throughout the course to become better learners (Davis & Schrader, 2009). Syllabi also communicate procedural and logistical information regarding due dates for assignments and exams, grading criteria, and anticipated learning outcomes (Parkes & Harris, 2002).

Students place significant value on parts of syllabi, such as exam and course assignment due dates, they believe will contribute to their success in the course (Becker & Calhoon, 1999). This suggests students approach syllabi as a course contract for

success (Davis & Schrader, 2009; Marcis & Carr, 2004). In contrast, faculty tend to place more value on parts of syllabi components related to expected student conduct (Davis & Schrader, 2009; Wolf et al., 2014), suggesting faculty utilize the document as a teaching tool. In some instances, such as large enrollment courses with multiple sections, faculty are expected to share a syllabus and have little control of the components and learning objectives that go into the document (Mitchell & Manzo, 2018). In instances where the same syllabus is shared across different course sections, faculty typically make fewer attempts to clearly communicate syllabi elements, resulting in less student use (Mitchell & Manzo, 2018). This leads to a feedback loop where the syllabus is further devalued.

Collier and Morgen (2008) further investigated these differences and found that instructors grew increasingly frustrated when students expected syllabi with more explicit content, as instructors felt the syllabi were already highly explicit. This disagreement between students and instructors can result in negative impacts on student performance, as some students fail to understand the expectations instructors have about students' coursework commitments (e.g., time spent on studying and assignments) (Collier & Morgen, 2008). Additionally, Aggar and Shelton (2015) investigated syllabi across private and public higher education institutions and found students at public institutions encounter more authoritarianism in their syllabi than at private institutions. Although Aggar and Shelton (2015) studied syllabi from a labor contract perspective for classroom and behavior management, they found high syllabi diversity between institution type and class size. On a larger scale, this higher diversity among syllabi can contribute to student confusion and miscommunication as students must navigate varying syllabi across their undergraduate career. Existing literature continues to highlight how students and instructors value and view components of syllabi.

While approaches to syllabi differ between students and instructors, a common attribute of most syllabi is the inclusion of course and learning objectives. It is possible that the terms course objective and learning objective are used interchangeably in the extant literature, but as we focus on course objectives for this study, we feel the need to clarify the differences between the two. In this study, we use the term course objective to mean a goal to be achieved by the student after completion of the course, whereas our operational definition of learning objective is informed by Mitchell and Manzo (2018) as, "...a commonly used metric with which students can be assessed" (p. 456). Furthermore, we posit that course objectives may also include less measurable goals put in place by instructors, such as developing an appreciation for a specific topic. Most higher education institutions require course objectives for each class, but in Texas specifically, each course taught at the university level has state-mandated course objectives. Course objectives can guide syllabi development and highlight what students should know and be able to do after being instructed on a topic (Allan, 1996; Hartel & Foegeding, 2004). Mitchell and Manzo (2018) state that a well-developed and clear learning objective includes a verb that contains an observable action item, conditions for when the action should be carried out, and the associated performance level. Clear learning objectives allow students to know exactly what is required of them (e.g., contractual) and what they will learn as a result of completing requirements (e.g., teaching tool) (Mitchell & Manzo, 2018). Instructors can also provide additional instruction about how students can use learning objectives to track the trajectory of their learning throughout a course (Osueke et al., 2018). For example, in writing-intensive courses, instructors might communicate learning objectives through examples of exam questions and descriptions of answers to communicate performance expectations (Yule et al., 2010). Students can track their learning trajectory by comparing their answers on previous exams to determine potential improvement strategies to achieve higher performance expectations. In this way, instructors can help bridge the gap between differing valuations of learning and possibly course objectives, making syllabi more useful to students.

A common theme in the extant literature is the exploration of differences and relationships between students' and instructors' views of syllabi and learning objectives. For example, past research has explored the relationship between students' and instructors' expectations of syllabi content in fields such as nursing (Davis & Schrader, 2009), psychology (Becker & Calhoon, 1999), political science (McCrea & Lorenzet, 2018), management (Mitchell & Manzo, 2018), and introductory biochemistry courses (Osueke et al., 2018). However, what the literature fails to explore is the role explicit syllabus-stated course objectives play in fragmented communication between students and instructors. Additionally, research that explores the relationship between explicit syllabus-stated course objectives, teacher reported intended course objectives, and student perceptions of intended course objectives in biology courses is lacking. Students might perceive course objectives differently than how the professor intends for them to be interpreted and/or how they are expressed in the course syllabus, therefore, addressing differences in perceptions of course objectives could provide insight for improving communication between students and

instructors. The purpose for this study was to investigate the relationship among student reported perceptions of course objectives, professor reported intended course objectives, and explicit syllabus-stated course objectives. This project was guided by the following research questions (Figure 1):

1. In what ways do professor reported intended course objectives compare to explicitly syllabus-stated course objectives? (Fig. 1A)
2. In what ways do student reported perceptions of course objectives compare to professor reported intended course objectives? (Fig. 1B)
3. In what ways do student reported perceptions of course objectives compare to explicitly syllabus-stated course objectives? (Fig. 1C)

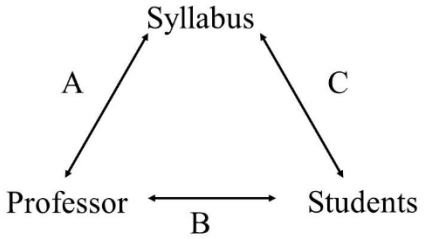

Fig. 1: Illustration of communication triangle for research questions.

Theoretical Framework

Instructional communication theory classifies the professor as a communicator. The professor's success in this enterprise relies on: 1) their communication conduct and 2) their opinions and views on communication (Staton-Spicer & Marty-White, 1981). Three paradigms comprise instructional communication theory: process-product paradigm, student-mediated paradigm, and culture-of-the-school paradigm. Our project focuses on process-product paradigm of instructional communication theory, which assumes teacher behaviors precede, and are most responsible for, student learning and achievement (Morreale et al., 2014). In our study, the usage of explicit syllabus-stated course objectives by professors represents the process, and accurate (as defined and described by professors) student perception of course objectives represent the product. It is important to note that in this case the term accurate is entirely derived from the perspective of the professor, as they create and communicate the course objectives throughout the semester.

Previous studies of the process-product paradigm have explored three stages of instruction: preoperational, process, and product (Staton-Spicer & Marty-White, 1981). The preoperational stage typically involves measuring teacher characteristics (such as their opinions of and methods for communication), the process stage typically includes observation of teacher classroom behaviors, and the product stage assesses teacher effectiveness by measuring student outcomes.

For this project, since we are more interested in students' understanding of course objectives rather than student learning outcomes, we framed the preoperational stage as determining how teachers display course objectives in their classrooms. Our process component consisted of course syllabi and interviews to assess how the objectives were displayed (explicit vs. implicit). The product component of our study was students' ability to correctly remember and identify course objectives (Fig. 2).

Methodology

Context

In this study, we investigated an introductory biology course designed for non-science majors. In accordance with Texas House Bill 2504, all undergraduate course syllabi in Texas are required to have explicitly stated course objectives for each course

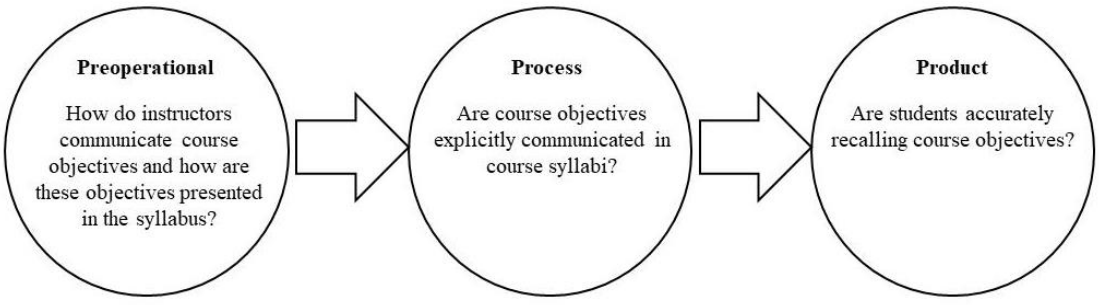

Fig. 2: Process-product paradigm of instructional communication theory

which are published on a university's website for public access (Kolkhorst, 2009). Student outcomes from taking the course should include the ability to demonstrate understanding of basic biology principles, have at least a conversational knowledge of modern biological science, and be able to make wise decisions regarding health and nutrition based on metabolism, physiology, and genetics.

At the university of this study, department policy dictates that introductory courses with multiple sections, taught by multiple professors have identical course objectives to ensure continuity of content for students across sections. While the course objectives for both sections of the course were identical (Table 1), each instructor created their own syllabus and determined how to incorporate the course objectives into their course.

Table 1. Course objectives for an undergraduate non-majors biology course.

Course Objectives
To examine the nature of science, the scientific method, & hypothesis testing.
To examine cell diversity, structure, & function.
To examine basic chemical principles, the nature of organic molecules, & the function of chemicals within cells.
To examine the role of energy in maintaining life & learn how cells acquire & use energy.
To examine the structure & function of DNA especially as it pertains to protein synthesis.
To examine the principles of inheritance (genetics) & explore patterns of inheritance in humans.
To examine the principles & regulation of cell division, & the consequences of malfunctions in the regulation of cell division (e.g. cancer).
To examine aspects of biotechnology & discuss the role that biotechnology plays in our world, including an exploration of the ethics & consequences of emerging technologies.
To examine the anatomy & physiology of the human reproductive system.

Participants

Participants for this study included two professors, Professors Richards and Kommala (pseudonyms), who taught three sections of the same introductory biology course for non-science majors at a large university in Texas and their undergraduate students. We asked undergraduate students enrolled in each professor's course to voluntarily take part in an online, open-ended questionnaire wherein we asked students to describe their ideas about course objectives and how these course objectives were communicated in the course. Per IRB approval (2017319), we obtained participant consent, administered the questionnaire, and conducted semi-structured interviews near the end of the course.

We collected data from student responses (n=424), as well as individual semi-structured interviews with each participating professor (n=2) to establish intended course objectives and identify how each professor conveyed those objectives within and beyond their course syllabus. We also used the course syllabus from each professor to verify the course objectives were explicitly stated for each course section.

Data Analysis

We examined responses and identified common themes that emerged across all participants and data sources using an inductive approach to coding. We transcribed data verbatim and then applied descriptive codes to each student-identified objective. We then used an inductive approach to coding to sort student responses based on themes which naturally arose from the data and reflected student perceived course objectives. We then used a deductive approach to categorize responses as either "accurate" or "inaccurate" based on a comparison to explicit syllabus-stated course objectives. Then we examined responses not aligned with explicit syllabus-stated course objectives and compared them to the professor's interview response.

At least two members of our research team coded each data source. When discrepancies arose between researchers, differences were discussed until a consensus over conflicting ideas was reached and a final coding was agreed upon. Consistency in this approach was high with an inter-rater reliability of 96%. We employed member checking with each professor to ensure our interpretations of their course objectives were consistent with their intended objectives. We also generated frequency counts of student response accuracy by counting responses that further evidenced our interpretations of the data. Multiple student responses required separation into two categories. These instances account for the higher number of total coded responses than the total number of students. For example, we coded the student response, "To understand the basic biology behind an organism. Such as cell structure, and DNA and how it all shapes living organisms and its functions" for both general biology content and genetic biology content.

Results

Course Objectives

Professor reported course objectives:

During our individual interviews with each professor, both discussed at length the importance of showing

students that science is approachable and relevant in everyday life. Professor Richards recognizes the science content-based course objectives outlined in her course syllabus, "the course objectives...because of the way the state of Texas is and the requirements are…" but did not focus on them. Instead, Professor Richards discussed her implied course objectives that centered around themes of science perception and life skills. "My learning objective in a non-majors course is not so much sciencey… I want them [students] to leave class feeling good about science…and just have better critical thinking skills." These themes continued throughout the interview, as Professor Richards described the importance of leaving non-science majors, "feeling like science is approachable," and teaching them to be, "a little more skeptical about what they read and what they hear and what they believe." Similarly, Professor Kommala also stressed the need to make science approachable for non-majors, as evidenced in her interview: "…the course objective is to do the applied measures of biology without making the students hate biology." Additionally, Professor Kommala attempted to relate biology to, "daily life" as evidenced in her interview:

> "humans are affected or benefited by the microorganisms… I extract the main concepts that apply to daily life, like what makes you sick and why you have less immunity to a disease when you have cancer and when you go through chemo."

Both professors provided similar course outcomes for their students but did not convey these objectives into their syllabi.

Student reported course objectives.

While coding student responses to the questionnaire, we found some students reported multiple course objectives (n=610). Three themes emerged from these reported course objectives: Knowledge (n=539), Practice (n=30), and Performance (n=41) (Table 2). These themes were further subdivided to gain a more in-depth understanding for student perceptions of course objectives.

We coded student responses that described an act of learning or acquiring new knowledge as Knowledge (n=539). We then further subdivided these responses: Biology-Based Knowledge (n=403), Nature of Science (n=82), Directly from the Syllabus (n=13), Reflective (n=15), and Personal (n=26). Most student perceived course objectives (n=403) identified biology-based knowledge (e.g., "to gain a better understanding of the world around me from an atomic level to a biological level" and "to understand what biology really means"). Although most student responses under this theme were generic in nature, it does illustrate that students recognize that the course objective is to learn biology content.

Table 2. Themes and subthemes that emerged from student responses to questionnaire.

Theme	Subtheme	Example
Knowledge (539)	Biology Based Content (403)	Learning the basics of modern biology, such as how organisms grow, work, and reproduce.
	Nature of Science (82)	Basic understanding of scientific theory, to know what science is.
	Directly from Syllabus (13)	To examine cell diversity, structure, and function; to examine basic chemical principles, the nature of organic molecules, and the function of chemicals within cells.
	Reflective (15)	Ensuring that students gain a stronger sense of the world around them and how each living thing comes to be.
	Personal (26)	My goals for this course is to become more knowledgeable about the study of living things.
Practice (30)	Science Specific Skill (14)	Learning how to apply content from the course in a practical/objective manner.
	Non-Science Specific Skill (16)	To be able to think more critically.
Performance (41)	Grade Driven (41)	Getting an A so my grade doesn't drop.

Student responses categorized as Practice (n=30) centered around gaining critical thinking skills. Examples of this category included "the ability to demonstrate critical thinking skills," and "to apply the information I know to real world situations." We further subdivided these responses into science specific skills (n=14) (e.g., "using the scientific method to test out biological functions"), and non-science specific skills (n=16) (e.g., "to be able to think more critically"). These responses showcase that students identify skills that are applicable both within and outside the field of biology.

We coded the remaining student perceived course objective responses (n=41) as Performance based goals that centered upon passing or making a good grade in the course (e.g., "I just want to pass; I need to get an A in the class"). This theme was unrelated to the course and centered around the individual students' performance in the course.

Comparison of Course Objectives

Professor to syllabus. Both professors stressed course objectives which differed from those objectives listed in their course syllabi during their interviews. For example, both professors' explicitly stated course objectives focused on specific Biology topics intended for the course (Table 1), whereas their implied objectives focused on themes of science perception, life skills, and making biology more approachable. As these implied course objectives were not included in the syllabi, the variability between implied and explicit syllabus-stated course objectives highlights how professors can not solely rely on their syllabus to communicate all course objectives to students, but also must rely on classroom actions to present learning objectives.

Student to professor. Student questionnaire responses of perceived course objectives (n=569) aligned with professor intended objectives Knowledge (n=539) (e.g., "…I really focus on concept and applications in the teaching and in the class.") and Practice (n=30) (e.g., "the ability to demonstrate critical thinking skills). These findings suggest students recognized the professors' intended course objectives regarding skills and familiarity with science rather than the explicitly-stated course objectives outlined in the syllabus. This could suggest an influence of the instruction practices used by the professors. Both professors indicated their daily use of various classroom activities (e.g., lectures, active learning activities, etc.) to reinforce their intended course objectives for their students. While the intended objectives appeared to be the target of each professors' daily lessons and were recognized by the students, neither professor transferred them to the syllabus.

Student to syllabus. Student reported perceptions of explicit syllabus-stated course objectives were largely "inaccurate" (n=480). Very few students identified an actual course objective (n=130), and fewer (n=13) students copied their response word for word directly from the syllabus. This suggests that few students know where to find information about course objectives. Our findings show many students believed the course objectives to be "to learn modern biology" or "the fundamentals of science." However, given the highly-specific nature of the state-mandated policy, these perceived course objectives are considered inaccurate.

Summary

Both professors acknowledged the required course objectives mandated by the State of Texas, but reported similar implicit course objectives which included making science more accessible and relatable. We identified three themes when we asked students to report their perception of course objectives - knowledge, practice, and performance. Most student responses support the knowledge theme (n=539) as students can identify the objective is to learn biology content, but other responses support the practice (n=30) and performance (n=41) themes.

We found both professors stressed intended course objectives (making science more approachable, critical thinking/life skills) when we compared the explicit course objectives in the syllabus to their responses in their respective interviews. When we compared students' perception of course objectives to professor course objectives, students aligned more with the professor intended objectives rather than those explicitly stated in the syllabus. Specifically, students' perceptions of knowledge and practice aligned the most with the professor objectives. Lastly, we found few students could correctly identify the explicit course objectives in the syllabus, which suggests many do not know where to access information about their course objectives as clearly stated in their syllabi.

Discussion

Our findings highlight the breakdown of communication between professors and students regarding explicitly stated course objectives in syllabi. Students' inaccurate identification of course objectives explicitly stated in the syllabus provides evidence towards a disconnect between professors' intended course objectives and those explicit syllabus-stated course objectives. Given students incorrectly identified explicit syllabus-stated course objectives, but did correctly identify their professors' implied course objectives, it is evident that instructors should spend additional time and effort discussing and addressing course objectives presented solely in the syllabus (Mitchell & Manzo, 2018). Our findings provide support for the extant literature on the disconnect between course syllabi and students, as our

participants were unable to recall the course objectivesstated in their syllabus (Aggar & Shelton, 2015; Becker & Calhoon, 1999; Collier & Morgen, 2008; Osueke et al., 2018).

It has also been shown that students have difficulty recalling information presented in the syllabus throughout the semester (Smith & Razzouk, 1993), and prefer having a syllabus that focuses more on assignment details and grading policies (Appling et al., 2012). Our findings align with these conclusions, as students had difficulty accurately recalling course objectives, but reported their desire to have the information they need to succeed in the class. In contrast, instructors believe a course syllabus should serve to describe the course's purpose, academic honesty policies, and student conduct policies (Wolf et al., 2014). Creating course syllabi that meets the needs of both students and instructors is ideal but can be challenging and time consuming for an instructor.

While both our research and previous research suggest listing course objectives in the syllabus alone is not an effective form of communicating the instructor's goals for the course, simply removing course objectives is not a viable option due to a variety of administrative requirements (Albers, 2003). It is important for instructors to reflect on what outcomes they want students to achieve and craft course objectives that meet both the instructors' personal goals, state- or department-mandated expectations (Rubin, 2016; Schaub et al., 2017), and student expectations and requirements.

Within the framework of Instructional Communication Theory (Morreale et al., 2014) we found the process of explicitly stating course objectives in syllabi is ineffective, as most students (n=480) could not correctly identify course objectives from the syllabus. However, the product of students' accurate interpretation of course objectives as stated by the professor does work when the professor uses other ways to communicate their course objectives (e.g., using active learning activities in class). This is evident through the professors' reinforcement of course objectives at the start of lecture and in assignments (Appling et al., 2012). Given students could accurately identify implied course objects based on the professors' daily teaching practices, we recommend professors use other methods to communicate course objectives to their students.

If students are not accurately interpreting the intended course objectives that are outlined in course syllabi, they may not achieve personal, professor, department, or even University-desired outcomes for the course. However, further research is needed to determine how student performance is influenced by their ability to accurately interpret course objectives. Understanding how students use syllabi could be insightful when planning instructional methods, thus increasing the chances of student success in the course (Bain, 2004; Becker & Calhoon, 1999). Our findings indicate that students recognized course objectives the professors identified in their interviews over those explicitly stated in the syllabus. This is most likely due to the frequency and manner in which these ideas were covered and re-enforced through classroom activity. Therefore, we recommend professors clearly tie the intended course objectives covered in class back to those explicitly stated in the course syllabus to ensure re-enforcement of the ideas covered through classroom activities and assignments.

Conflict of Interest

The authors declare no affiliation or involvement with any organization or entity with any financial interest, or non-financial interest, in the subject matter discussed in this manuscript.

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