# Hidden Curriculum Awareness:

## A comparison of engineering faculty, graduate students, and undergraduates


Idalis Villanueva, Ph.D.
Engineering Education Department
College of Engineering
Utah State University
Logan, UT 84341
idalis.villanueva@usu.edu

Laura Gelles, Ph.D. Candidate
Engineering Education Department
College of Engineering
Utah State University
Logan, UT 84341
laura.gelles@aggiemail.usu.edu

Katherine Youmans, M.S.
Engineering Education Department
College of Engineering
Utah State University
Logan, UT 84341
katherine.youmans@aggiemail.usu.edu

Marialuisa Di Stefano, Ph.D.
Department of Teacher Education & Curriculum Studies
College of Education
Amherst, MA 01003
marialuisadi@umass.edu



*Abstract*—

In order for an engineering academic body (e.g., faculty and students) to navigate their surroundings, they must first become aware of the hidden curriculum around them. Hidden curriculum represents how particular assumptions, values, attitudes, and beliefs about schooling manifests in practice. When understood, these types of lessons or messages allow students, faculty, and staff to more easily navigate the academic and socio-political customs needed for success.

As part of a larger study, a total of 224 participants across 57 engineering programs in the United States and Latin America were asked to comment on a survey that asked respondents about the expectations they perceived are placed on engineering students or faculty at their institution and from what source they believed these expectations came from. Preliminary findings pointed to concerns from participants that standardization (e.g., ABET) may not consider the unique resources needed among a diverse group of students as well as impinge contradictory influences on competency development in engineering. Also, the notions of elitism in engineering was seen among underrepresented participants as potentially harmful, in terms of mental and emotional health, in engineering. Results from this work can guide administrators, educators, and policy makers in engineering to consider the context and unique challenges of engineering students and faculty alike in meeting the expectations of this field.



***Keywords—hidden curriculum; expectations; engineering faculty; engineering undergraduates and graduates; awareness***


## I. INTRODUCTION

### *A. Curriculum, Types, and Transmissions*

In educational environments and settings, curriculum encompasses the practice of learning and schooling [1]. More specifically, curriculum consists of the content that students are expected to learn, the processes by which students achieve the identified course goals, and the strategies that educators use to achieve these goals within the settings where teaching and learning occurs [2].

Curriculum can fall into one of four categories: formal, informal, null, and hidden [1-3]. Formal curriculum includes explicitly written expectations that are used to evaluate the quality of a product (e.g., homework) and performance (e.g., exams) [4]. Informal curriculum includes the ways by which learning happens within working spaces or via personal interactions [4]. Similar to the formal curriculum, informal curriculum involves the intentional impartation of information from the teacher to the student [4]. Null curriculum includes those items that may not be covered in a class due to several confounding factors such as regulations from higher authorities, lack of comfort-level from a teacher to discuss a given topic (e.g., politics), or the controversial nature of the topic [1-4]. Finally, hidden curriculum (HC) includes the intrinsic "attitudes, knowledge, and behaviors" [5, p. 125] that can be communicated unintentionally or without aware intent. This means that in addition to the knowledge and skills that educators convey in a classroom, the learner also receives a "vast array of behaviors, beliefs, and attitudes" that are not recognized by the educator as being imparted to the student [6 p. 20]. For example, if an instructor decides to assign more points to a specific homework problem, a student may translate this information as that particular topic being included on a future exam. Thus, hidden curriculum manifests itself at the unconscious, nonverbal spaces of the classroom [3] and professional settings [7], cueing individuals' perceptions and interpretations of their environment and its context [8].

In a classroom, students do not just learn what is being formally presented in the course but also accumulate other 'hidden' lessons in the process. The literature suggests that approximately 80% of 'hidden' cues, information, content, and messages are unconsciously processed by the human brain [3]. When these cues are presented continually and over time, the central message or theme becomes engrained in the individual's reflective processes until eventually it becomes part of a common value, belief, or attitude [3,8].

As a result, what was once an unconscious and hidden message or lesson soon becomes the norm [3], or better known as the foundations by which requirements for behaviors, conduct, and other rules in a schooling system are communicated. Regarding the latter point, the transmission of these curricular norms can occur through either implicit or explicit means. Implicit means of curriculum can include those elements that are crafted within the thinking processes of individual educators but that are not written down or published and as such, cannot be replicated by others [2]. Explicit forms of curriculum, on the other hand, have been carefully designed, tested, and presented or published by educators. These include considerations of learners, knowledge, personal and social development, and instructional guidelines, all of which have been written or documented for reproduction [2].

Furthermore, the intentionality of the curriculum, as expressed by a key individual (e.g., educator) can yield the lessons learned or messages that a student acquires. Both the intentionality (i.e., with or without aware intent) as well as the transmission (i.e., implicit or explicit) of a lesson or message in a classroom can result in one or more types of curriculum as depicted in Table I.

It is important to note that although hidden curriculum has traditionally has been placed in the "without aware intent" and "implicit transmission" categories [1-8], the authors posit that in disciplines where norms may not be examined or questioned (e.g., engineering), there may be an explicit transmission of information that is communicated unintentionally due to its lack of awareness of such [6]. For the purpose of this work, awareness is defined as a sub-component of consciousness where an individual internalizes an experience (by seeing, knowing, or feeling) rather than having to infer upon it [9]. This exploratory study will assess the primary forms of curriculum perspectives that engineering faculty and students convey around the expectations and sources of expectations in engineering.

TABLE I. FOUR TYPES OF CURRICULUM (ADAPTED FROM [10])

| | **Implicit** | **Explicit** |
|---|---|---|
| **With Aware Intent** | Informal Curriculum<br>Null Curriculum | Formal Curriculum<br>Null Curriculum |
| **Without Aware Intent** | Hidden Curriculum<br>(*traditionally defined*) | Hidden Curriculum<br>(*proposed added definition*) |

### *B. Hidden Curriculum Perspectives*

An individual's awareness or recognition of hidden curriculum can derive from several perspectives: (a) functional; (b) liberal; (c) critical; and (d) post-modern [11], [12]. A functional perspective of hidden curriculum focuses on what systems and structures of education do to maintain social order and stability. This perspective views educational systems and structures as vehicles through which students learn the social norms, values, and skills needed to function and contribute to society. At the same time, functional perspectives posit that individuals are passive recipients of this information, which may serve to reaffirm the status quo [11]. Liberal perspectives of hidden curriculum centers around those taken-for-granted assumptions and practices of school life, which although is created by several actors (e.g., teachers, students), takes the appearance of normality through daily production and reproduction [10]. Liberal perspectives include school rules, codes of discipline, teacher-student relationships, and processes of learning. It recognizes that individuals in these educational systems can take agency over these hidden lessons, if an awareness is attained. Critical perspectives of hidden curriculum supports the notion that hidden or unintended consequences of schooling leads to the reproduction of social injustice [13]. Postmodern perspectives do not localize hidden curriculum to just some groups or classes but rather views power as being circulated through discourses [11,12] and, as such, individuals can resist institutional forces and situate accounts of oppression, and "inform the 'micro' contestations to domination in particular settings" [11, p. 187].

While it is important to reveal any potential social, political, or educational interferences that hidden curriculum may uncover, the "task of enabling people to understand what motivates such interference is perhaps even more important" [11, p. 177]. Thus, the purpose of this study is to explore how engineering undergraduates, graduate students, and faculty (all actors in the engineering education system) become aware or understand the contradictory and, many times, hidden lessons learned in engineering. One focus was to explore if these lessons learned were interpreted as intentional and explicit (e.g., formal curriculum), intentional or implicit (e.g., informal curriculum), recognized as not being taught or transmitted but needed (e.g., null curriculum) or unintentional/intentional transmission (e.g., hidden curriculum).

### *C. Exploring Hidden Curriculum in Engineering*

In fields like education, psychology, business, and medicine, hidden curriculum research has been used as an approach to identify and predict potential issues, that if not attended, could lead to dismal outcomes (e.g., drop-out) [1-8]. While hidden curriculum traditionally is associated with negative issues, if accompanied by an appropriate intervention, can serve to convey a positive message and outcome instead [1-8]. Hidden curriculum studies in fields like science, technology, engineering, and mathematics (STEM) have explored the role that that a syllabus design has on guiding gender expectations [14] and minorities' access [15] in classrooms. A limited amount of studies have attempted to explore hidden curriculum in gender roles in engineering and ethics reform [14], [15]. To our understanding, no study has attempted to compare hidden curriculum messages among engineering students and faculty to find the lessons being learned in this field nor the source of these perspectives.

## II. METHODOLOGY

### *A. Positionality*

All members of this research team are intersectional, self-identify as women, and are underrepresented in their respective fields of study. All provide a breadth and depth of perspectives whose continual discussions allowed the research team to holistically interpret the qualitative findings in this work. All recognize the prevalence and influence that both positive and negative hidden curriculum lessons have played in their respective education and professional paths.

*B. Research Design*

The research study design is originally part of a more comprehensive and extended mixed-method experimental intervention design [16] using a custom-created survey to explore hidden curriculum awareness and its corresponding emotions, self-efficacy, and self-advocacy perspectives for engineering undergraduates, graduates, and faculty [6], [17]. For this work, we focused on the HC awareness perspectives and in particular, the qualitative portion of participants' written statements.

All elements of this study were conducted by adhering to ethical standards and treatment of human subjects as required by the Institutional Review Board of the home institution of the first author.

*C. Research Questions*

The central research questions and sub-questions are:

RQ1. What types of curriculum perspectives are being communicated by engineering faculty, graduates, and undergraduates?

a. How do these perspectives differ among the different engineering groups?

RQ2. What expectations about engineering do faculty, graduates, and undergraduate students convey?

a. What hidden curriculum perspectives are communicated among the participants?

*D. Participants*

For this work, 224 undergraduate students, graduate students, and faculty in engineering across 57 institutions of higher education across the United States, Latin America, and Puerto Rico were recruited. Inclusion criteria encompassed that the participants must be actively employed or studying in a college of engineering and were willing to participate. Exclusion criteria included individuals working in industry, retired, or not actively engaged in a college of engineering. If participants did not answer the question or included terms like "N/A", these were excluded from the study. A breakdown of participant demographics can be found in Table II.

TABLE II. PARTICIPANT DEMOGRAPHICS (N=224)

| | |
|---|---|
| **Gender** | 70% Male; 29% Female; 1% Non-binary/third gender; 0.5 % Prefer to not say |
| **Race** | 51% White; 27% Latinx; 13% Asian; 7% African American; 2% Other |
| **Age** | 65% (18-29 years); 14% (30-39 years); 12% (40-49 years); 5% (50-59 years); 4% (60+ years) |
| **Educational/ Professional Level** | 65% (Undergraduate Student); 20% (Graduate Student); 15% (Faculty) |
| **First-generation** | 57% (No); 42% (Yes); 1% (Not sure) |

*E. Data Collection and Analysis*

To assess participants' raw responses about hidden curriculum, two qualitative questions were asked before participants were introduced with a definition of hidden curriculum and some representative statements found in the engineering education literature [17] that were included in the survey. These two questions will be the focus of this exploratory study and are summarized in Table III.

TABLE III. QUALITATIVE QUESTIONS ASKED FROM PARTICIPANTS

| |
|---|
| 1. What expectations do you think are placed on engineering students (if you are a student) or faculty (if you are a faculty) at your university? |
| 2. Where or who do you think those expectations come from? |

For these responses, a combination of *a priori,* descriptive, axial, and magnitude coding were used for this study to extract main themes and patterns among participants. More specifically, for *a priori* coding, the definitions of "functional", "liberal", and "critical" perspectives were used among the participant responses. The definition of "postmodern" was omitted from this coding as future work will focus on this topic further. For all coding cycles, intercoder agreement was conducted among two members of the research team until full consensus was achieved.

Since the context of the institution (U.S. versus non-U.S. based) and classification (based upon research foci and resources) may influence participant responses, participant entries were labelled according to the type of institution the responses originated from based on Carnegie classification [18] although its equivalencies were also used for those institutions that did not fall under the Carnegie definitions (e.g., some Latin American universities):

- *Tier 1 (Doctoral universities- Highest research activity)*
- *Tier 2 (Doctoral universities- Higher research activity)*
- *Tier 3 (Doctoral universities- Moderate research activity)*
- *Tier 4 (Master's Colleges & University: All Programs Sizes)*
- *Tier 5 (Bachelor's & Community Colleges: All Program Sizes & Types)*

## III. RESULTS

For the first research question and sub-question, a distinction of the lessons learned amongst three of the four types of curriculum (formal, informal, or hidden) were explored for the participant responses. A frequency count, converted to percentages, of the coded responses are summarized in Table IV. From these perspectives, three themes emerged: (a) competencies, (b) standardization, and (c) resources.

TABLE IV. PERCENTAGE OF CURRICULUM PERSPECTIVES

| Engineering Participants | Formal | Informal | Hidden |
|---|---|---|---|
| Undergraduates | 60% | 12% | 28% |
| Graduates | 59% | 19% | 22% |
| Faculty | 36% | 50% | 14% |

**a. Competencies:**

For competencies, all participants acknowledged the primordial role that the rigor of the engineering curriculum as well as the administration plays in ensuring that desired competencies are acquired in engineering. Among the desired competencies, participants commonly agreed on skills such as efficiency, quality (in the form of product/project output), and high academic performance (e.g., GPA) are essential to engineering. These skills were equated to increasing the chances of successful career attainment or progression:

> … engineers have to cover more topics for the same amount of credits, so the coursework is compressed without decreasing the difficulty or workload. For example, an English major is not expected to complete a semester with four courses and three labs, requiring hours of homework per class, lab experimentation, lab analysis, and a lab write up between 30 and 60 pages per two week lab cycle - this occurs for engineers during their junior and senior years. The expectation to perform in extracurricular activities (such as design competitions) and full time work in an engineering field (internships) come from job prospects after college - if you don't do these things, you have little chance of being hired at a preferable firm for a reasonable starting wage (the primary reason the majority of students enter the engineering program).
> (Graduate student, #40, White, Male, U.S. Tier 1)

> High expectations to fulfill works and designs at with high efficiency closely to perfection
> (Undergraduate student, #88, Latinx, Male, U.S. Tier 3)

> High expectations to succeed for both students and faculty. For students, there is an expectation to get good grades. For research faculty, there is an expectation to bring in significant money. For lecturers, there is an expectation of excellent teaching and service.
> (Faculty, #36, White, Male, U.S. Tier 1)

**b. Standardization:**

Particularly among faculty, the concept of standardization was expressed through the fulfillment of Accreditation Board of Engineering and Technology [19] criteria in their disciplines. Interestingly, among students, an emerging sub-theme was the perceived disjoint between maintaining quality engineering education and upholding institutional standards related to engineering competencies.

> The ability to read and comprehend theory, practice equations and learn the standards to which engineers will be held.
> (Undergraduate student, #1, White, Female, U.S. Tier 2)

> ABET accreditation and [institution] struggle…closing the gap between quality and expectation (not all but most classes above sophomore level)..[…] a strong sense of standardization correlating with competency.
> (Undergraduate student, #155, White, Male, U.S. Tier 1)

**c. Resources:**

The resources needed to complete and sustain a successful engineering career were perceived differently among participants. For some participants, resources involved monetary support and time to complete the degree. For others, resources involved accommodations to ensure that individuals with different challenges can succeed in engineering. And for other individuals, ensuring that the curriculum included proper classroom support mechanisms for students to complete the degree was important.

All participants commonly conveyed an overall concern that engineering education does not consider the resources needed to account for a diverse student population with varying contexts and challenges and the field's expectations success to occur regardless of these constraints:

> Lots of time and money dedicated to the [engineering] degree.
> (Undergraduate student, #157, White, Female, U.S. Tier 1)

> To make more time than we actually have to do each class's assignments. Each class seems to think we have at least 2-3 hours every day to work on assignments for that class. 4-5 classes means I need between 8 and 10 hours a day to study and do homework for each class. This would be possible if I had nothing to do but study, but I have a family and I work, which makes this extremely difficult.
> (Undergraduate Student, #139, White, Male, U.S. Tier 1)

> We make our students take a heavy load of classes, making it impossible for them to work or attend part time.I.E., we limit enrollment to traditional students!
> (Graduate Student, #24, White, Male, U.S. Community College)

> To do well in classes that are sometimes poorly taught. High GPA, extracurricular, and experience all at once while trying to manage to afford school.
> (Faculty, #5, Latinx, Male, U.S. Tier 1)

> Succeed despite any differences or special challenges
> (Undergraduate student, #89, White, Female, U.S. Tier 1)

> Engineering students in my school are expected to climb the social ladder through the professions that we are pursuing. We do not have a lot of resources so students have to be initiative and constantly reach out to other companies to make an impression.
> (Graduate Student, #23, Asian, Male, U.S. Master's College)

To answer the second research question and sub-question, an analysis of the main hidden curriculum perspectives from the first research question was conducted to assess functional, liberal, or critical perspectives. A frequency count, converted to percentages, of the coded responses are summarized in Table V. From the hidden curriculum perspectives, additional themes emerged: (a) consequences to success and (b) deification of engineering.

TABLE V. PERCENTAGE OF HIDDEN CURRICULUM PERSPECTIVES

| Engineering Participants | Functional | Liberal | Critical |
|---|---|---|---|
| Undergraduates | 12% | 57% | 31% |
| Graduates | 10% | 50% | 40% |
| Faculty | 50% | 0% | 50% |

**a. Consequences to Success:**

For many participants, meeting the requirements of an engineering degree and career also implied the unexamined tolls of work-life balance. In addition, for some students, particularly underrepresented students, meeting the requirements of the profession resulted in negative consequences to their well-being and perceived self-concept. Faculty, who are also expected to manage multiple roles and convey dissonant messages in their classes, also appears to exacerbate the latter.

> I think we have extreme pressure to succeed. I think the expectations are great and weigh on myself greatly
>
> (M.S. Graduate Student, #8, African American, Male, U.S. Tier 1)

> To excel above all and it is actually really hard (for me currently). If your in engineering you can't be "dumb" or slow or whatever if not people will just walk over you.
>
> (Undergraduate student, #75, African American, Female, U.S. Tier 1)

> Faculty are here to serve the students, the department and the profession. The expectation is that we will teach, train, guide, cajole, demonstrate to, harass, encourage, evaluate, explain to, commit to, be here for, challenge, entertain, broaden, deepen and ultimately transform each student into a proto-professional entrant into the field of […] engineering […] We are also expected to have fun.
>
> (Faculty #41, White, Male, Full Professor, U.S. Tier 1)

**b. Deification of Engineering:**

Many students and faculty participants agreed that engineering comes with messages of elitism and prioritization of the field over other disciplines. Along with this viewpoint, many participants acknowledged that an expectation for this elitism is a dedicated commitment to the profession, even it may prevent students' access and navigation throughout this degree.

> It is our duty to the student, the university, the profession and the larger society to confer credentials only to those students that have demonstrated a sufficient mastery of our course of study.
>
> (Faculty #41, White, Male, Full Professor, U.S. Tier 1)

> They have to be super smart and dedicated and must put in a lot of work. They have to study all the time and must love math and science.
>
> (Undergraduate student, #39, White, Female, U.S. Tier 1)

> …during the last semesters [in engineering], we were continually exposed to contents and ideas that reflected our future employers as flawless organizations to which we had to prove our worth from day 1. Everyone would repeat us mantras such as "engineers provides solutions, not problems", conditioned us that, even if the organization we were working in didn't provide the necessary tools, training, management and organizational climate, we were accountable for poor results. Nobody really prepare us to the ethical challenges that come with the job.
>
> (Undergraduate Student, #51, Latinx, Male, Latin American University)

One interesting sub-theme identified was the idea that commitment and dedication to engineering would result in automatic privileges (e.g., status, careers) upon graduation. Some pointed to the irony of these ideas:

> There was also a subliminal direction that professionals trained there would work in industries within a radius fairly closed to the campus.
>
> (Undergraduate student, #9, Latinx, Female, Latin American University)

## IV. DISCUSSION

For the first research question and sub-question, it was found that among engineering undergraduate and graduate students, perspectives centered around issues of the formal curriculum where the inherent structures of the engineering departments and curriculum influenced participants' responses and reactions to the field. In these groups, issues related to competencies and required coursework were focused whereas faculty emphasized on the need to meet the requirements of the larger administration (e.g., colleges, universities) in fulfilling promotion and tenure expectations. This latter group also provided more perspectives related to the informal curriculum, and more specifically on the taken-for-granted assumptions behind students' backgrounds. It seemed there is an overall recognition that many students can be non-traditional or require additional assistance in their classrooms. Ironically, none of the faculty mentioned what types of actions they do to tackle these issues in their classes. For all participant, hidden curriculum awareness was found to be low compared to the formal and informal perspectives. This finding parallels to what Villanueva and colleagues have recognized [6], [17] where there is an overall limited awareness of this phenomenon in this field.

Many participants also conveyed the sometimes conflicting messages between required competencies in engineering, access of resources to engineering, and the role of standardization (e.g., ABET) in achieving successful attainment and retention of engineering degrees or careers. It was interesting to note the discourses presented by the participants, particularly around the role that standardization could have in the way instructors and students challenges and successes in engineering. Additional work is needed to explore this further.

For the second research question and sub-question, it was found that amongst the hidden curriculum perspectives, engineering graduates and undergraduates recognized liberal perspectives more than faculty. Interestingly, faculty spoke about the functional and critical perspectives of engineering but did not allude to any liberal standpoints. It is possible that faculty have already passed the period in their career where, when once conscious in their undergraduate and graduate education, has slipped "beneath the realms of conscious reflection to become a norm that is part of a formalized system" [20 p. 2]. Another possibility is related to exposure. In a classroom where their role is more present, faculty may be taking for granted their role in students' recognition of this hidden curriculum. It is possible that when asked to reflect on around unfamiliar settings and scenarios, awareness to these issues may be heightened. Additional work is needed to explore these faculty hidden curriculum perspectives in more detail.

Also, the themes of elitism and the consequences of success in engineering were found among the hidden curriculum perspectives. For elitism, it was interesting to note the dissonance between degree attainment and professional execution in the real world, as suggested by the participants. At the same time, the need for technical competency and mastery appeared to disconnect with the needs of society, its stakeholders, and the oftentimes-unexpected challenges of the engineering profession. This finding parallels to more recent calls from the engineering education community to better prepare students for real-world applications and recent initiatives to foster industrial connections with classrooms to convey a more realistic view of engineering [19].

One interesting finding was that the perspectives around the unintended consequences of an engineering degree or career among the participants, particularly as it related to work-life balance and mental and emotional well-being. Recent calls for more studies in mental and emotional health among higher education environments is being published [21]. However, to our knowledge, very limited work is being conducted in fields like engineering [6], [17]. This is a unique finding and warrants additional exploration.

Finally, while not explicitly addressed, it was apparent that from analysis of the participants' responses, that engineering conveys very intentional messages, which may implicitly or explicitly cue to students their belonging or fit to the field. Additional participants are needed to explore this phenomenon to see if hidden curriculum in these dimensions (as proposed in Table I) are indeed the case.

## V. LIMITATIONS

While this exploratory represented the primary perspectives of curriculum among these engineering participants, there were no granular studies based on gender, type of institution, and engineering degree. A deeper exploration of these may help provide more context and elevate the voices of the populations in a more meaningful way. However, the exploration of the three populations (undergraduates, graduates, and faculty) can help point to educational and professional level recognition of hidden curriculum and can provide researchers with an understanding of both the prevalent issues among these populations.

## VI. CONCLUSION

From this work, the authors call for a closer examination to the degree by which engineering institutions examine issues around the assumptions and hidden lessons conveyed in this study. In particular, issues of inequity of resources, work-life balance, and well-being in engineering needs further examination. For faculty, there is a need to develop more interventions to increase their awareness of hidden curriculum that may be present in their classrooms. For students, there is a need to help them connect to the realities of the profession better as well as help them find additional resources to help in their navigation of their degree.

## VII. ACKNOWLEDGEMENT

This material is based upon work supported by the National Science Foundation (NSF) No. EEC-1653140. Any opinions, findings and conclusions or recommendations expressed in this material do not necessarily reflect those of NSF.

## References

[1] Glossary of Education Reform, "Curriculum", last updated 08.12.2015; accessed on October 12, 2018, https://www.edglossary.org/curriculum/.

[2] L.H. Burton, "An explicit or implicit curriculum: which is better for young children," World Congress of the Organisation Modiale pour l'Education Prescholaire, Copenhagen, Denmark, August 13-16, 1998.

[3] F.W. Haefferty and E.H. Gaufberge, "The Hidden Curriculum," in A Practical Guide for Medical Teachers, 5th ed., Elsiever: Beijing, China, 2017, pp. 35-43.

[4] D. Cotton, J. Winter, and I. Bailey, "Researching the hidden curriculum: Intentional and unintended messages," J. Geogr. Higher Educ., 2013, 37, pp. 192–203.

[5] M.A. Alsubaie, "Hidden curriculum as one of current issues of curriculum," J. Educ. Pract., 2015, 6, pp. 125-128.

[6] I. Villanueva, M. Di Stefano, L. Gelles, K. Youmans, and A. Hunt, "Development and validation of a survey to explore hidden curriculum in engineering," IJEE, in preparation.

[7] D.R. Lipsett, "Developmental life of the medical student: curriculum considerations," Acad. Psych., 2015, 39, pp. 63-69.

[8] H.A. Giroux, "Theory and resistance in education: towards a pedagogy for the opposition," Greenwood Publishing Group: Westport, CT, USA, 2001.

[9] J.W. Schooler, "Discovering memories in the light of meta-awareness," J. Aggress. Maltreat. Trauma, 2001, 4, pp. 105-136.

[10] A. Hargreaves, "Teaching in the knowledge society: education in the age of insecurity," Teachers College Press: New York: NY, USA, 2003.

[11] A. Skelton, "Studying hidden curricula: developing a perspective in the light of postmodern insights, Curric.Studies, 1997, 5, 2, pp.177-193.

[12] A. Hargreaves, "The significance of classroom coping strategies," in L. Barton & R. Meighan (Eds) Sociological Interpretation of Schooling and Classrooms: a reappraisal. Driffield: Nafferton, 1978.

[13] P. Bourdieu, and J.C. Passeron, Reproduction in Education, Society and Culture. Beverley Hills: Sage, 1977.

[14] A.R. Bejerano and T.M. Bartosh, "Learning masculinity: Unmasking the hidden curriculum in science, technology, engineering, and mathematics courses. *J.Wom.Min.Sci.Eng.,* 2015, *21*,2, pp. 107-124.

[15] T. van Harmelen and C.W. Pistorius, "Improving access to higher education in South Africa. *IEEE Technology and Society Magazine*, 1998, 17*,* 1, pp. 16-22.

[16] J.W. Creswell and V.L. Plano Clark, "Designing and conducting mixed methods research," 3rd ed., Thousand Oaks, CA, 2018.

[17] I. Villanueva, L. Gelles, M. Di Stefano, B. Smith….G. Ryan, "What does hidden curriculum look like and how can it be explored" Proc. ASEE Annual Conference & Expo, 2018, pp. 1-16.

[18] Carnegie Clasification of Institutions of Higher Education, 2018, http://carnegieclassification.iu.edu/classification_descriptions/basic.pphp (accessed on 17 September 2018).

[19] ABET Board of Directors, "Criteria for accrediting engineering programs:effective for reviews during the 2018-2019 Accreditation Cycle, Eng. Accred. Commis.:Baltimore, MD., USA, 2018, pp. 1-45.

[20] I.Villanueva, T. Carothers, M. Di Stefano, and M.T.H.Khan, " 'There is Never a Break': The hidden curriculum of professionalization for engineering faculty," Educ. Sci., 2018, 8, 57, pp.1-21.

[21] M.Y. Tytherleigh, C. Webb, C.L. Cooper, and C. Ricketts, "Occupational Stress in UK Higher Education Institutions: A Comparative Study of All Staff Categories," *Higher Ed. Res.Devel., 2005,* 24, 1, pp. 41-61