AC 2010-1050: DEVELOPMENT OF THE PARENTS' ENGINEERING AWARENESS SURVEY (PEAS) ACCORDING TO THE KNOWLEDGE, ATTITUDES, AND BEHAVIOR FRAMEWORK

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Development of Parents' Engineering Awareness Survey (PEAS) According to the Knowledge, Attitudes, and Behavior Framework

Abstract

With increased interest in promoting engineering as a field of study and career pathway to both college and pre-college student, it is important to understand the many factors that impact students' learning and decision-making processes. In this paper, one of the important environmental factors surrounding students was selected as a main research subject: parents and other similar caregivers. Parents play a significant role in mediating between teachers and students as well as motivating children's interest in engineering. To better understand the influence of parents in children's engineering education, it is important to have a proper assessment tool for measuring parents' engineering awareness. However, while many researchers have acknowledged the importance of parental involvement, no suitable instrument exists to be used for parents (and other caregivers). The main aim of this study is to develop and empirically validate an instrument which assesses parents' knowledge of, attitudes towards, and behavior related to engineering education. This paper will present a rigorous instrument development model and an example of how this model has been applied. Additionally, the paper presents an example of an instrument that captures the three aspects of learning represented in the KAB framework: knowledge, attitude and behavior.

Introduction

Engineering has been facing challenges due to a highdrop-rate amongstcollege students in the United States despite an increased market demand for engineers and engineering professionals.[1,2] One response to this challenge has been an emphasis on engineering education for pre-college students, as this can play a pivotal role in motivating children into engineering.[3] In other words, students' engineering education experience in pre-college school is a predictor of pursuit and success of engineering degrees in college.[4, 5] According to the National Academy of Engineering and National Research Council (2009)[6], engineering education in K-12 schools poses potential benefits overall to students since engineering improves learning and achievement in other subjects, such as mathematics and science. Also, it helps students better understand engineeringand, thus, there is an opportunity for an increase in the number of students pursuing engineering. Indeed, engineering is the practical application of science, mathematics, and technology to solve problems by proceeding better lives for humans. Despite of the importance of engineering, many students, unfortunately, perceive engineering as a challenging area and even misunderstand the concept of engineering.[7]Here, some questions might be raised: what makes students perceive engineering as a difficult major? and What sources of information give students that impression?

Answers for these questions might be detected by considering factors surrounding students. Environmental factors, such as parents, peers, and teachers, affect students' educational aspiration and occupational interests. Among these factors, parental involvement highly influences both students and teachers.[8, 9] Many researchers in science and engineering education have shown that parents have a significant impact on students' learning and motivation to enter an engineering area in college.[10, 11, 12] Along the same lines, researchers in many diverse areas have focused on parental or family involvement in children's education achievement.[13, 14,15] These facts indicate that it is important to help parents, in addition to students, understand engineering properly so they would encourage their children to consider engineering in a right way. For that reason, education communities would have a better understanding of parents if they had an effective tool to assess how aware parents are of engineering, what parents believe about engineering, and the extent to which parents engage in engineering-related activities with their children to improve their children's understanding of engineering or engineering-related concepts.These three main questions can be referred to parents' engineering awareness, including three domains: knowledge, attitude, and behavior (KAB).

Theoretical Background

The measurement instrument in this study was designed based on the KAB framework. The KAB framework originates from Bloom's work in an effort to develop and classify instructional learning objectives for educators to teach students.[16] This work has guided educators who have sought an appropriate grounding for their teaching. The taxonomy initially consisted of three domains – cognitive, affective, and psychomotor domains. Bloom later focused more on the cognitive domain, and this work, referred to as "Bloom's taxonomy," has been widely used by educators and curriculum developers.[17] Knowledge, attitude, and behavior are the main indicators of each domain when researchers develop assessment. In general, knowledge is thought to be an outcome of learning, but knowledge can also be a guide for future learning.[18] Additionally, attitude is the most complex concept in terms of diverse definitions; however, mostly it refers to the growth of feelings and emotions attached to a particular action or thought which are related to behaviors.[19]Since behavior is considered more observable action, the frequency of participants' actions is commonly used to measure behavior.

Each domain of Bloom's taxonomy has been further developed by other researchers.[20,21, 22, 23]Mainly, the KAB approach has been used in many areas such as public health, nutrition education, and consumer science.[24,25, 26] From all of these efforts to characterize the KAB framework, one of the most critical findingsis the interrelationshipsamong knowledge, attitude, and behavior. Attitude and knowledge towards certain subjects are potential predictions of behavior responses.[27, 28] The most common example of utilization of the KAB framework might be in medical literature studying public awareness of AIDS and its prevention.[24]This study observed significantly positive changes in participants' knowledge, attitude, and behavior through a group discussion as a part of a community-based AIDS prevention program. Precisely, both information and attitude change correlated to the changes in behavior. In the same line with this, it is clear that education can positively influence on knowledge, attitude, and behavior. For example, Watson et al.[26] explored how much high school students can be influenced by education using pre and post tests. Through the completion of a nutrition course, not only did students' knowledge improve, but it was also found a potential that students' attitude and behavior were changed in a positive way. These results indicate how important implementing engineering course as a normal curricula.

Based on this body of previous research, we hypothesize that a parent (or caregiver)'s knowledge, attitudes and behavior regarding engineering education will also be interrelated. For example, we believe that parents with more knowledge about engineering and engineering education will be more likely to engage in behaviors related to engineering education for their children. Additionally, the previous research related to the KAB framework also suggests that all three of these aspects (knowledge, attitudes, and behavior) are key components of a learning experience. Therefore, in order to fully understand learning, it is important to investigate all three factors. However, little research of this kind has been conducted by the engineering education community, especially in regards to parents. Hence, the goal of this study is to develop an instrument for assessing parents'engineering awareness based on the KAB framework. If researchers, teachers, or policy makers are able to investigate parents' knowledge, attitudes, and behaviors related to engineering, they will have better insights in how to guide students' learning by understanding students' backgrounds and understanding how to communicate with parents.

Definitions of KAB

Prior to preceding the instrument development steps, it was important to possess accurate definitions of KAB framework based on the purpose of this study. Hence, a review of KAB studies was firstly called for, most findings of the review was stated in a previous section. To find clear borderlines of the KAB domains, a review of KAB-related studies in diverse areas was conducted. Three sections were focused on for the review: methods, definition or characteristics of each domain that authors used in their study, and the measurementtools of those domains. After reviewing KAB studies, several interesting findingswere revealed. Most importantly, different instruments were generally used to assess each domain. To be precise, for knowledge, there are two common ways to assess the main sample: test professional content-oriented knowledge related to the field, or test knowledge of basic principles and concepts which mainly targets general population. To investigate attitudes, it is common to include beliefs, feelings, and thoughts towards target subjects. Actual usage or frequency of related activities is used to assess behavior towards certain subjects since behavior is observable.

Given that a clear borderline among KAB domains doesn't exist, a unique definition of each domain was determined in this study by considering a ground theory of KAB. Characteristics of both attitudes and behavior were fairly distinctive; however, knowledge test can be either professional content-oriented or general knowledge-oriented. For the purpose of the study, it was concluded that the knowledge section relates to parents' understanding of general concepts and principles of engineering, attitudes refers to beliefs and thoughts regarding engineering and the possible inclusion of engineering in K-12 classrooms, and, finally, behavior pertains to parents' engineering-related activities with their children in their daily life. The following are the definitions of the three domains used in the study:

- Definitions
  1. Parents' engineering knowledge: comprehension of the basic principles and concepts of engineering
  2. Parents' engineering attitudes: feelings and beliefs about engineering

3. Parents' engineering behavior: the frequencies of activities parents do with their children

Methodology

Prior to beginning the process of developing this instrument, the Parents' Engineering Awareness Survey (PEAS), an instrument development process was initially developed based on the previous researches related to scale development.[29, 30] However, considering the new knowledge gained through the steps of the process, the initial instrument development model was modified to take advantage of other affordances along the way. The final process is presented in the Figure 1. Following the model, details of each process are described based on the steps.

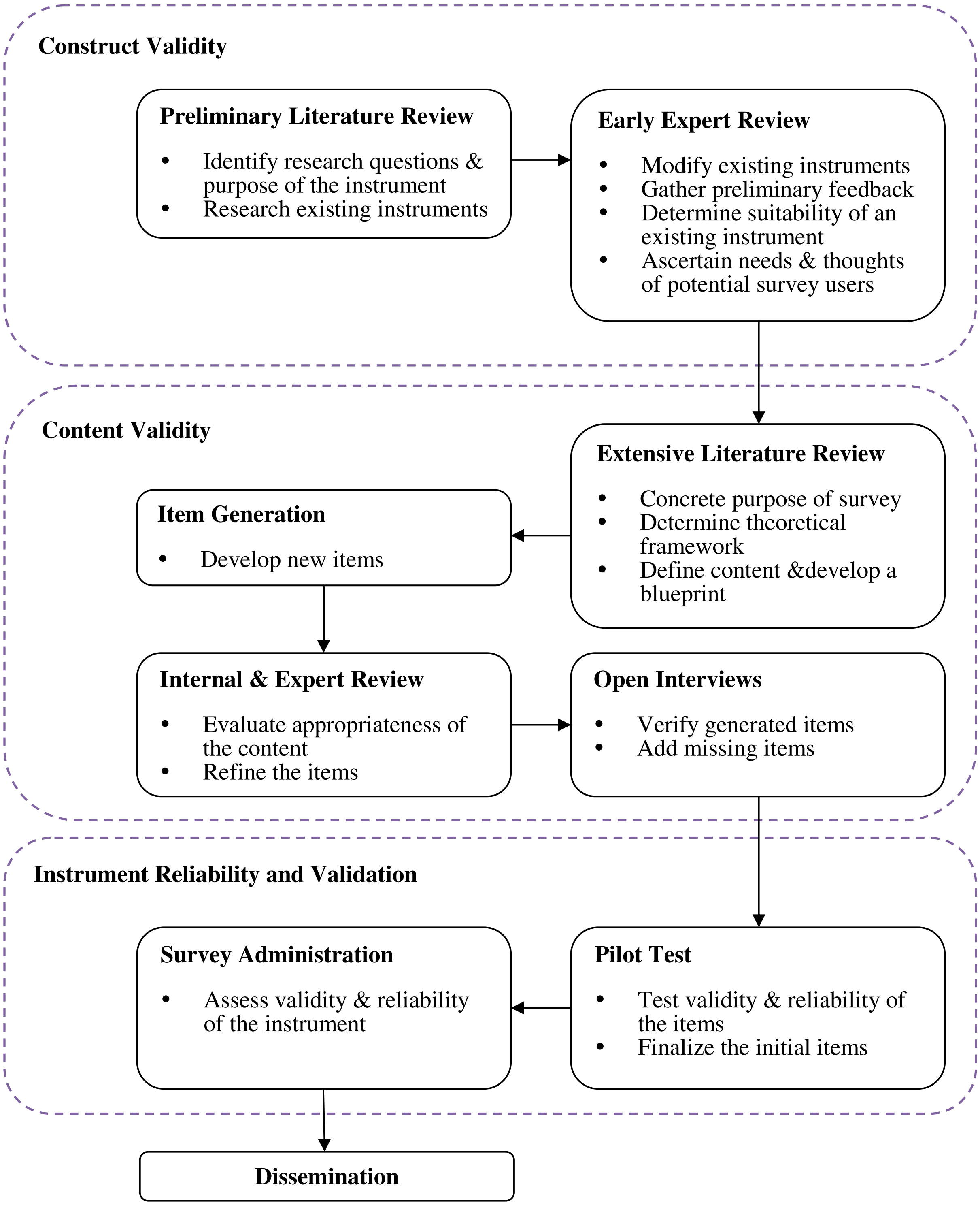

Figure 1: The Instrument Development Process

I. Identify the research questions and the purpose of the instrument

The first step in creating the instrument was to determine an intended purpose for the instrument as well as to develop our research questions. The underlying goal of the survey instrument developed through this study is to better understand what parents think about engineering and about including engineering in K-12 schools.For that reason, the instrument is designed for parents (and other caregivers)of children currently in K-12th grade. Ultimately, the survey instrument will allow to better capture the current status of K-12 engineering education in the United States. To accomplish a rigorously developed instrument, a thorough instrument development model was designed. The primary research questions for the instrument are:

- What do parents (and caregivers) of K-12 students know and believe about engineering?
- What are the attitudes of parents (and caregivers) of K-12 students towards the inclusion of engineering in K-12 classrooms?
- How might parents (and caregivers) of K-12 students support efforts to include engineering in K-12 classrooms?

II. Instrumentation

As a next step of instrument development, generation of scale was fundamental process based on the theoretical framework. Scale consists of statement items which eventually allow measuring each of KAB domains. For the content validity, it is highly recommended collecting relevant information from collaboration of experts.[29, 30] For that reason, expert review in this study was crucial in terms of instrument development. There has been a debate which one is more efficient and stable: developing measurement instrument based on the research purpose or adopting existing instrument which is already verified.[30]The rigorous process of instrument development was designed in order to address this issue.

A. Construct Validity

A literature review was undertaken to investigate studies related to the research questions of this study within science and engineering education studies. The key words for search were parents' impact on studentsandparents' awareness of engineering. This process provided a better understanding of the current research status regarding the main objectives of this study. Additionally, search for existing instruments related to this study's research questions was conducted with many different populations – K-12 students, college students, and teachers as well as parents. Portions of this literature review are included in the remainder of the paper, while a more comprehensive discussion is presented elsewhere[31]. The review indicated that no existing instruments are suitable for assessing parents although many researchers have acknowledged the importance of parental involvement for children's education.[14, 15, 32] There was one survey whose purpose was to explore K-12 teachers' perceptions and familiarity with teaching design, engineering, and technology (DET) developed by Yasar et al.[33]. Results of the study showed that although teachers acknowledge the importance of DET, most teachers were unfamiliar with DET and had lack of confidence to imply it. This may indicate that if parents are not familiar with engineering concept, it is less likely to know how to imply it and, consequently, to encourage their children.

Following an extensive review of the literature, a very preliminary version of the PEAS was developed based on an existing survey. To be precise, the DET survey was modified by focusing on wording so that the questionnaires were appropriate for parents instead of teachers. The primary purpose of this step was to provide a group of experts with something concrete that they could respond to. This "Early Expert Review" was conducted through a panel discussion with knowledgeable participants on K-12 engineering education, such as teachers, administrators, policy-makers, professionals, and other K-12 STEM Education researchers. In total, 24 experts reviewed the revised version of the DET survey and concluded that the survey did not conceptually fit for the purpose of the study.Experts also commented that although the survey was modified, it contains many professional terminologies for teachers in the survey. Eventually, through this process, it was verified that development of a new instrument specifically to assess parents' awareness was required.

Given that the main purpose of this study is to develop an appropriate assessment for parents, it is important to ascertain the needs and thoughts of potential users of the survey, which are educators in this case. Due to that, a second panel discussion was conducted with 12 experts in diverse areas. The experts included teachers, administrators, policy-makers, professionals, and other K-12 STEM education researchers. Using semi-structured questionnaires and open conversations, opinions were elicited during the spring of 2009. The discussion lasted approximately 40 to 50 minutes. One main question directed to the participants was what they wanted to know from parents in an effort to improve engineering education for students. Main findings of this discussion were that it was desirable to investigate how much parents know about engineering and are willing to encourage their children to pursue engineering. Additionally, policy-makers wanted to know whether parents have interests in adopting engineering course in K-12 schools. This result naturally led to the following steps: an extensive literature review to concrete fundamental theory of the instrument and item generation based on the potential users' needs.

B. Content Validity

Based on the literature review and results from the panel discussions, the main framework was determined to use in this study. The KAB framework was the most appropriate theoretical framework, because it fits for the purpose of this study in that it is desirable for researchers and educators to have a comprehensive understanding of what parents are aware of, how parents feel, and what kinds of activities parents do with their children in an effort to improve engineering education for children. With insights from these procedures, items were fundamentally generated by six members of the project team from the areas of engineering education and educational research. In total, 72 items were generated. Through several internal rounds of review,those items were polished to accomplish an accurate match between the purpose of this study and the characteristics of items. Also, wording and grammar of the items were thoroughly checked to ensure that the instrument is accessible to a wide range of populations, and, thus, it can be easily used by other researchers as well as teachers. As a result, 45 items remained.Through these steps, not only were overall items refined but also the main concept of the instrument became more concrete.

The45 itemswere then examined by a panel of eight experts. All eight of these experts have experience with K-12 Engineering Education research. These experts include former K-12 teachers, university faculty and parents. The expert review was intended to evaluate the appropriateness of the content, wording, and the level of the language of the items based on the purpose of the instrument.[34]Following the review, all items were polished and asked to evaluate the appropriateness of each items by experts using 5-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree). None of the items were dropped since the scores of the appropriateness of the items were all high enough (above 3). In addition to a panel discussion, parents interview were conducted to capture any missed items and, therefore, 3 more items were added.As a result, the initial measurement scale with 48 itemswasfinally generatedbased on the KAB framework.

C. Instrument Reliability
A pilot test was performed to ensure the initial measurement scale items were reliable. The 48 items were tested through online survey with a convenience sample of parentsof children currently in K-12th grade. The questionnaire was provided to participants who met our sample criterion.For the knowledge and attitude items, a self-reported 5-point Likertscale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree) was usedto rate the agreement of each item. To assess behavior items, a frequency 5-point Likert scale (1 = Never, 2 = Less than once a year, 3 = Once or twice a year, 4 = About once a month, 5 = At least once a week) was used since behavior is an observable variable. The reliability test of the instrument was performed using Cronbach's coefficient alpha with the criterion of being above 0.7.[30, 35]In addition to responding to the items themselves (i.e., selecting the appropriate Likert Scale rating), the pilot participants also provided feedback on the three scales (knowledge, attitudes, and behavior) as well as the survey as a whole.

D. Instrument Validation and Future Analysis
The survey will be administered to a purposive sample, K-12 parents, to empirically validate the instrument, and produce the completed Parents' Engineering Awareness Survey (PEAS). Currently, data is being collected. After collecting more data using the final scales developed in this study, factor analysis will be conducted to assess the validity and reliability of the instrument. Precisely, principle components factor analysis (PCA) with varimax rotation will be used not only to purify the measurement scales but also to discover underlying themes of parents' engineering awareness. The procedure will be conducted using Statistical Package for the Social Science (SPSS). With the result of the PCA, confirmatory factor analysis will also be conducted to investigate interrelationships among KAB domains using Analysis of Moment Structures (AMOS).

Preliminary Results

I. Sample Profile

Through the pilot test including open-ended questionnaires, qualitative analysis was conducted to identify areas and items of interest for the quantitative study. Also, interesting pattern is found through the responses. Thirty-seven volunteers who met the sample collection criteria (parents of current K-12 students) participated in the pilot study. Participants were predominantly females (67.6 %) and White/Caucasian (81.1 %). Majority of participants (83.8 %) completed a bachelor's or higher degree, and their annual income ranged between $20,000 and $140,000.

Among participants, 64.9 % answered although they are not engineers, they and their children have interacted with engineers, such as family, relatives, or friends. Table 1 shows a summary of demographic information for the participants.

Table 1. Descriptive summary of participants

Sociodemographic Variable		Frequency (N)	Percentage (%)
Gender			
	Male	10	27.0
	Female	25	67.6
		35	
Age			
	30 - 39	14	37.8
	40 - 49	18	48.6
	50 - 59	5	13.5
		37	
Income			
	Under $ 20,000	1	2.7
	$20,000 - $39,999	2	5.4
	$40,000 - $59,999	1	2.7
	$60,000 - $79,999	7	18.9
	$80,000 - $99,999	8	21.6
	$100,000 - $119,999	4	11.1
	$120,000 - $139,999	5	13.9
	$140,000 or more	8	22.2
		36	
Household type			
	Married, children living at home	33	89.2
	Married, children not living at home		
	Married, no children		
	Unmarried-couple, children living at home		
	Unmarried-couple, children not living at home		
	Unmarried-couple, no children		
	Single parent, children living at home	4	10.8
	Single parent, children not living at home		
	Single, live alone		
	Other		
		37	
Education			
	High school	2	5.4
	Associate's degree	1	2.7
	Bachelor's degree	9	24.3
	Master's degree	18	48.6
	Doctorate	4	10.8
	Other	3	8.1
		37	
Ethnicity			
	White/Caucasian	30	81.1
	African-American	2	5.4

	Native American		
	Asian	3	8.1
	Other	1	2.7
		36	
Education Background			
	I have a degree in science.	8	21.6
	I have a degree in mathematics.	2	5.4
	I have a degree in technology.	2	5.4
	I have a degree in engineering.	3	8.1
	No, I do not have STEM related degree.	22	59.5
		37	

II. Key Findings of Pilot Study

One of the main purposes of the pilot study was to verify the reliability of the PEAS instrument. The Cronbach coefficient alpha of 16 items in the knowledge component of PEAS instrument was 0.94, 0.91 for attitude instrument with 20 items, and 0.84 for behavior instrument with 12 items. Table 2 indicates the summary of the reliability test.

Table 2. Summaries of Cronbach's Alpha Test

Components	Number of Items	Mean	Variance	Cronbach's Alpha (α)	Cronbach's Alpha based on Standardized Items
Knowledge	16	3.508	.208	.943	.946
Attitude	20	3.969	.451	.914	.934
Behavior	12	3.352	.737	.843	.841

Note: N=37.

a. Knowledge: 5-point Likert Scale (1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly agree)
b. Attitude: 5-point Likert Scale (1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly agree)
c. Behavior: 5-point Likert Scale (1=Never, 2=Less than once a year, 3=Once or twice a year, 4=About once a month, and 5=At least once a week)

Table 3 shows the responses for a subset of the items from PEAS. Through the knowledge items, we see that parents (or caregivers) are aware of the importance and benefits of engineering to the society and the relevance of engineering to other STEM areas. In particular, item 5 and item 4 showed the highest means under knowledge items: 'I know how engineering can be used to help society.' (M = 4.25, SD = 0.81) and item 4 'I know how engineering is related to science, mathematics, and technology.' (M = 4.08, SD = 0.97). However, parents hesitated when they try to help their children learn about engineering principles: item 10 'I know how to apply engineering-related concepts in my daily life.' (M = 2.97, SD = 1.21), item 11 'I know how to explain engineering-related concepts to my children.' (M = 2.97, SD = 1.18), and item 12 'I know how to help my children with his/her engineering ideas and skills.' (M = 3.00, SD = 1.18). Among attitude items, it seems that participants were strongly positive about the importance of engineering education for their children and consider its importance is equivalent to both boys and girls. For example, item 2 and item 4 are the highest scores: ‘I believe engineers make our life more convenient.’ (*M* = 4.57, *SD* = .70) and ‘I think engineering improves our society.’ (*M* = 4.54, *SD* = .56). Finally, for the behavior patterns of parents, the resultsindicate that parents encourage children to learn engineering skills by guiding children’s thinking and recommending engineering-related toys: item 5 ‘I encourage my child to identify and solve problems.’ (*M* = 4.77, *SD* = .55) and item 4 ‘I encourage my child to play with engineering-related toys (for example, Legos, Blocks, Puzzles, or Building something).’ (*M* = 4.03, *SD* = 1.34). On the other hand, it is less likely for both parents and children to attend engineering fairs together: item 10 ‘My child and I have attended engineering fairs together.’ (*M* = 1.71, *SD* = .99).

Table 3. Statistics Summary for a Subset of the PEAS Items

	Statements	Mean	Variance
Component 1: Knowledge		***3.50***	***.21***
Item 3.	I know what engineers do.	3.83	1.03
Item 4.	I know how engineering is related to science, mathematics, and technology.	4.08	.97
Item 5.	I know how engineering can be used to help society.	4.25	.81
Item 10.	I know how to apply engineering-related concepts in my daily life.	2.97	1.21
Item 11.	I know how to explain engineering-related concepts to my child(ren).	2.97	1.18
Item 12.	I know how to help my child(ren) with his/her engineering ideas and skills.	3.00	1.15
Item 14.	I know how to find out more about engineering information to help my child(ren)’s learning.	3.58	1.30
Item 16.	I am aware of engineering curriculum at my child(ren)’s school.	2.94	1.29
Component 2: Attitude		***3.97***	***.45***
Item 1.	I believe engineering improves our quality of life.	4.51	.56
Item 2.	I believe engineers make our life more convenient.	4.57	.70
Item 4.	I think engineering improves our society.	4.54	.56
Item 6.	I want my child(ren) to pursue a career in engineering.	3.66	.87
Item 10.	I think my child(ren)’s school should teach engineering concepts and skills.	4.23	.69
Item 14.	I want my child(ren) to learn engineering skills.	4.17	.66
Item 15.	I want my child(ren) to understand what engineers do.	4.20	.76
Item 16.	I think it is more important for girls to learn engineering than it is for boys to learn engineering.	2.29	1.15
Item 17.	I think it is more important for boys to learn engineering than it is for girls to learn engineering.	2.23	1.14
Item 18.	I think it is equally important for both girls and boys to learn engineering.	4.51	.66
Component 3: Behavior		***3.35***	***.74***
Item 1.	I play with engineering-related toys (for example, Legos, Blocks, or Puzzles) with my child.	3.71	1.34
Item 3.	I read books, stories, or articles about engineering topics/issues with my child.	2.97	1.34
Item 4.	I encourage my child to play with engineering-related toys (for	4.03	1.34

	example, Legos, Blocks, Puzzles, or Building something).		
Item 5.	I encourage my child to identify and solve problems.	4.77	.55
Item 9.	I go to the park with my child for his/her engineering knowledge.	2.89	1.32
Item 10.	My child and I have attended engineering fairs together.	1.71	.99
Item 12.	I would encourage my child to participate in engineering fairs.	2.66	1.03

Discussion and Implications

"Positive attitude but little knowledge of engineering"

It was interesting to find that most respondents tended to have a common pattern; although the attitude of engineering is positive, their knowledge of engineering is low. Particularly, the rating regarding the item "I am aware of engineering curriculum at my children's school" is very low ($M = 2.42$). However, the item "I think my children's school should teach engineering concepts and skills" had one of the highest score ($M = 4.25$) among attitude scale. Additionally, respondents seemed somewhat concerned about their own ability to teach their childrenengineering-related concepts and principles. Along the same line, respondents scored low for the item "I know how to find out more about engineering information to help my child(ren)'s learning." This implies there is need for parents to have more support regarding engineering education for their children.

"Environmental factors matter"

In the area provided for giving additional feedback on the survey itself, one respondent mentioned that if her husband was not an engineer she would be less aware of engineering, and, therefore, less likely to do engineering-related activities with their children. Another respondent stated that her engineering interest came from the encouragement of the city including industry and schools. Since she could easily access the information related to science and engineering education around where she lives, it is easier to encourage her children. Additionally, we note that the impact on students can also come from others such as teachers. One respondent noted her child became interested in engineering from class activities; the teacher implements science and engineering skills into the class. These findings emphasized that environmental factors, including parents, teachers, and society, play an important role in helping children learn engineering content and skills.

"No gender difference in the importance of engineering skills for children"

Regarding the importance of engineering education, there was no different between boys and girls. To be precise, one of the items in attitude scale that had the highest score ($M = 4.42$) was: "I think it is equally important for both girls and boys to learn engineering." This is reinforced through the ratings for two additional items: "I think it is more important for boys to learn engineering than it is for girls to learn engineering ($M = 2.0$)" and "I think it is more important for girls to learn engineering than it is for girls to learn engineering ($M = 2.0$)"

The work presented in the paper has many implications. While we plan to collect additional pilot data to empirically validate the instrument and, therefore,produce the completed Parents' Engineering Awareness Survey (PEAS), the data collected so far not only showed the reliability of the instrument but also revealed interesting trends that we can further investigate with the finalized instrument. The data collected with the finalized survey will also be used to examine correlations of parents' KAB related to engineering. Furthermore, the Parents' Engineering Awareness Survey (PEAS) will provide engineering educators good insights into the impact of parent's understanding of engineering on students. Additionally, the survey will provide baseline information about parents' general interest in the inclusion of engineering in K-12 classrooms. Finally, the survey is being developed with the hope that it will provide a good assessment tool in the future for other research groups, K-12 outreach programs, and teachers interested in gauging their students' parents' interest in and awareness of engineering. The major contribution of this paper, however, is the presentation of process that we have used to develop this assessment instrument.

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