



Characterizing the next generation of medical device innovators: Ghanaian student perceptions of biomedical engineering



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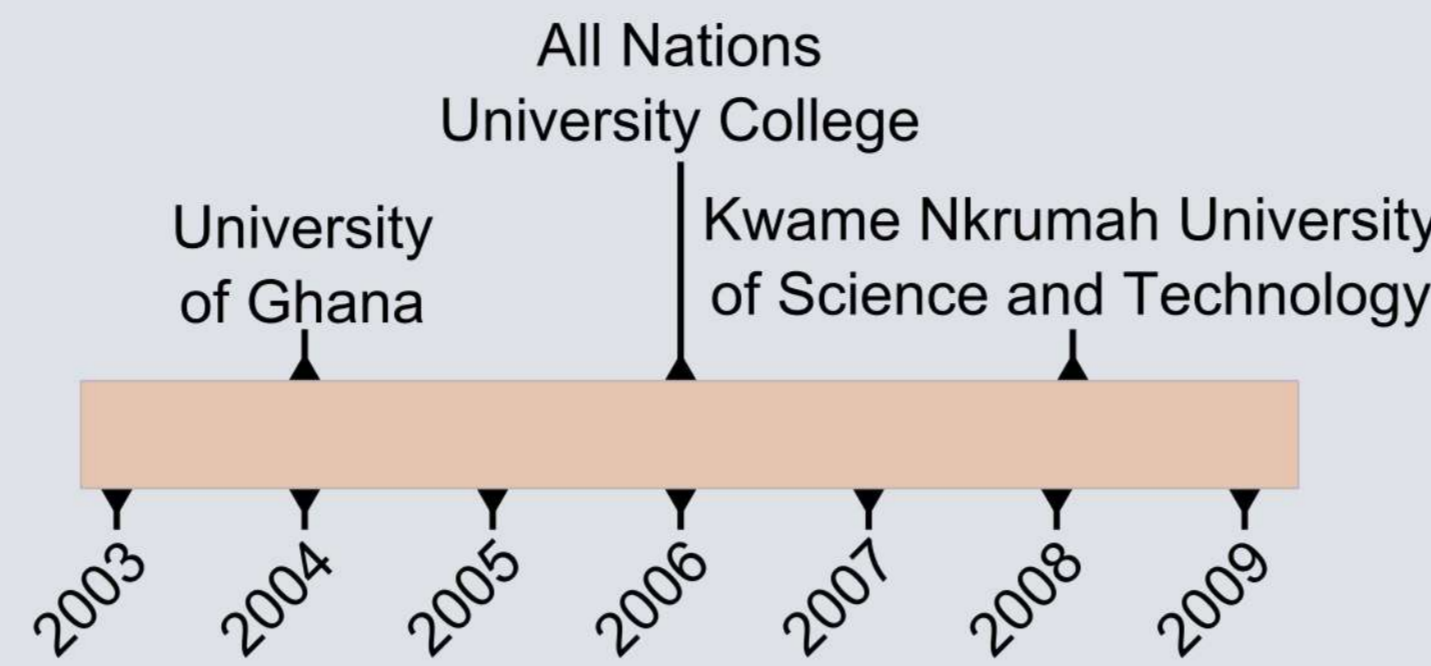
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Background

- Human capacity is a key component to the quality and availability of healthcare in LMIC.
- Growing, but minimal emphasis on training next generation medical device innovators in LMIC.
- Recently, undergraduate biomedical engineering programs have been established in sub-Saharan African countries.
- A need exists to assess program outcomes, specifically in supporting students to think of themselves as future designers and innovators in the field.

BME Programs in Ghana:

Establishment of four-year programs in Ghana offering a Bachelor of Science in biomedical engineering:



Previous Research:

- Current demand for biomedical engineers is primarily in the area of bioinstrumentation.
- Fewer than 30% of biomedical engineering graduates are applying their skills and knowledge in their employment (Amisshah et al. 2013).

Research Questions:

- What are biomedical engineering students' perceptions of their discipline? What influences their perceptions?
- What job opportunities do biomedical engineering students see for themselves upon graduation? How do these opportunities compare with their perception of what it means to be a biomedical engineer?

Participants & Data Collection

- Five question survey instrument developed.
- Survey distributed to 10 freshman, 10 sophomore, 10 junior, and 10 senior biomedical engineering students.
- A follow-up survey was distributed to explore the most interesting results.

Survey Questions:

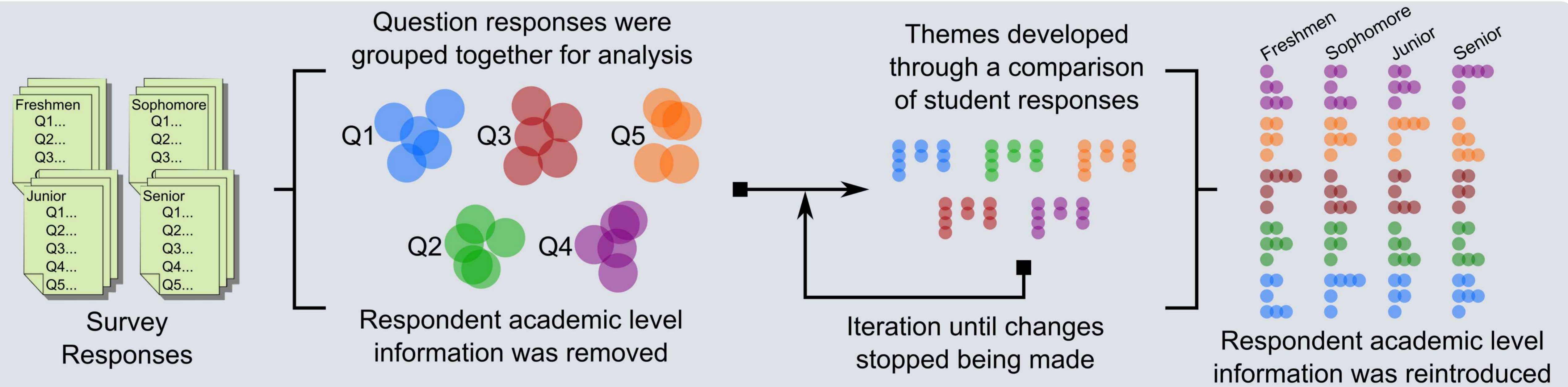
- Q1.1 What does a biomedical engineer do?
- Q1.2 What do you expect to do after you graduate?
- Q1.3 What do you expect biomedical engineers to be doing in 2030?
- Q1.4 What experiences have you had that contributed to your understanding of what biomedical engineers do?
- Q1.5 Why did you decide to study biomedical engineering?

Follow-up Survey

- Q2.1 After graduation, do you intend to further your education? Why or why not?
- Q2.2 Describe the job opportunities you will have in Ghana after graduating as a biomedical engineer?
- Q2.3 How will your decision to pursue or not pursue further education affect your job opportunities?
- Q2.4 Have you completed an internship in biomedical engineering? If yes, how did this internship affect your understanding of biomedical engineering careers in Ghana?
- Q2.5 How did your courses affect your understanding of biomedical engineering careers in Ghana?

Data Analysis

- Thematic analysis with a pooled set of student responses with academic level information removed from responses.
- Process repeated for responses from the follow-up survey.



Results

Lower Classmen (represented by 3x3 grid) Upper Classmen (represented by 4x4 grid) Box size is proportional to strength of theme

Q1.2: What do you expect to do after you graduate?

- I will further my education or look to gain more experience.
- I will solve health related issues or design new devices.
- I will maintain, repair, or sell medical equipment.*
- Other.

- "Acquire hands-on training at health institutions on various health related problems..."
- "Enter graduate school and specialize in tissue engineering or medicine"
- "...gain work experience in the field of bioinstrumentation"
- "Firstly, to further [my] education with a master's degree, then employ myself by identifying health related issues...to solve them."
- "...to do my master's. To specialize in a branch of BME."

*This student response is probably related to the job opportunities students are likely to have access to upon graduation.

Q1.4: What experiences have you had that contributed to your understanding of what biomedical engineers do?

- Experiences during internships at hospitals, research centers, and/or companies.
- By reading and/or researching on the internet.*
- When I learned about a specific medical device.
- Experiences at the university or during admissions.

- "...internships with biomedical engineer institutions..."
- "...my internship at Acuadio-centre in Korle Bu [hospital]..."
- "The internships I took part in during the vacation."
- "...internship[s] at the hospital and [where I] had the chance to work with [biomedical engineers]."
- "...an internship in a hospital and I was working with the hospital engineers and that really made me want to understand what biomedical engineering really is."

*Lower classmen who have not yet been exposed to internships develop their knowledge of biomedical engineering careers from non-university materials on the internet

Follow-up survey:

Q2.1 Why or why not do you intend to further your education?

- I need to further my education because it is necessary to get a good job.
- I need to further my education because I want to specialize in a specific field.
- I need to further my education because I want to learn more about BME
- I want to further my education in another field.
- Other.

- "...because a[an undergraduate] degree is not enough to compete with, not in BME..."
- "...because if I want a good job that pays well, I need to further my education..."
- "The courses taught at the undergraduate level are to provide fundamental knowledge in the profession. Further education is therefore needed to enable me to perform competently in the job market."

Q2.2 Describe the job opportunities you will have in Ghana after graduating as a biomedical

- The most likely job I will have is in the sales, repair, maintenance, or procurement of hospital equipment.
- There are many different job opportunities available

- "...bioinstrumentation is the most practical [job available]..."
- "...working on the maintenance and repair of hospital equipments..."
- "Job opportunities for biomedical engineers in Ghana are in the fields of bioinstrumentation, clinical engineering, and medical imaging at various hospitals..."

Q2.3 How will your decision to pursue or not pursue further education affect your job

- It will increase my job opportunities.
- I need further education to specialize in a specific field.
- Further education will allow me to increase my salary or obtain a better job.
- Other.

- "...deciding to pursue further education would create more job opportunities."
- "Pursuing further education... gives me a wider scope of opportunities."
- "I believe that in this modern day, a bachelors degree does not provide the vast opportunity I would like to have. Hence, I'll need additional education to expand my options."

Conclusions

- The survey study described above shows how BME students perceive both their discipline and their employment opportunities in Ghana where biomedical engineering is an emerging discipline
- While students define biomedical engineering as a discipline dedicated to solving healthcare challenges through the application of science and math, they also feel that their post-graduation employment options are highly limited to a form of biomedical technician.
- In an attempt to obtain better job opportunities students decide to pursue further education.

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Citation

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