



# **Current Status of the Affirmative Sustainable Support for Scholars in Energy Technologies (ASSSET) and its Impact of Engineering Education**

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## **Abstract**

This presentation is an *Evidence-based Practice*. The research describes the current status of the affirmative sustainable support for scholars in energy technologies (ASSSET) program and explores its potential impact on the graduate and retention of engineering students. This NSF S-STEM funded project provides scholarships and educational support to low-income, academically talented students entering and pursuing engineering studies at the University of Louisiana at Lafayette. Its main objective is to increase the retention and graduation in fields related to energy technology. It supports students in the chemical, civil, electrical, mechanical, industrial technology and petroleum engineering. The ASSSET program was developed with the plan of incorporating evidenced-based practices such as a cohort model, mentoring, field experiences, internships with local industry, workshops, and seminars to support a senior research project. Each ASSSET scholar has a matched faculty mentor from their engineering discipline who will be with them from the time they enter the program until graduation. The focus is on energy technologies as this will help the United States to remain competitive in the global market. Energy is a highly interdisciplinary field, and it can be studied from different engineering perspectives. The project is in its inaugural year and currently supports 12 students including eight freshmen, three sophomores and one junior. This research delineates the process by which the cohort of students was selected, describes the educational and mentoring opportunities, and discusses the programs impact on students in this first year. The paper will also discuss the potential for retention and quality of education for the ASSSET scholars.

## **Goals of the ASSSET Program**

With an NSF S-STEM grant awarded in 2021, UL Lafayette's ASSSET scholarship program started in Fall 2021. Plans and activities are set to meet three (3) main goals:

1. Improve the UL Lafayette's College of Engineering retention and graduation rate by supporting low-income academically talented students pursuing a bachelor's degree in one of the six engineering majors with a focus on Energy Technologies.
2. Implement evidence-based practices to enhance students' engagement in undergraduate research activities, and
3. Create a sustainable path to ensure students success beyond the life of the scholarship program.

## **Major Activities**

Planning activities

In summer 2021, the majority of activities included planning activities to prepare the program's foundation in the first year. The team coordinated with the College of Engineering Dean's office, Energy Institute of Louisiana, Office of Scholarship, Office of Financial Aid, and Academic Advisors. In addition, the team worked with department heads within the college to advertise the program and encourage students to apply. Furthermore, the program was advertised in different orientation sessions for freshman engineering students. During the summer, the team worked with the Dean's office and UL Lafayette's Academic Success Center to develop two customized courses for the ASSSET program entitled "Fundamentals of Energy Technologies" (for freshmen) and "Advancements of Energy Technologies" (for sophomores). The freshman-level course will be offered in fall and the sophomore-level will be taught in spring semesters to balance the teaching load for faculty. As another planning activity, a list of potential guest speakers was created in summer 2021.

### Student Selection

At the end of the summer, the team created a short list of eligible applicants and interviewed students to finalize the selection process and launch the program in the Fall-2021 semester. By the end of Jul 2021, we received 34 applicants out of which 25 were eligible in terms of academic/financial background. The 25 eligible applicants (17 freshmen, 6 sophomores, and 2 juniors) were ranked based on 1) GPA (20%), 2) ACT score (70% applied only to freshmen), and 3) statement of purpose (SOP) in their application form, plus and interview (10% applied to the average of SOP and interview scores). The students were interviewed by 3 STEM faculty and one Education faculty. The student selection was finalized in mid-Aug 2021 and the committee sent offer letters to the first ASSSET cohort.

### Training mentors

In the Spring of 2021, Dr. Heather Stone became a certified mentor trainer by the Center for the Improvement of Mentored Experiences in Research (CIMER). This program trained her how to improve research mentoring relationships for both mentors and mentees and included a study of evidenced-based and culturally responsive interventions. Dr. Stone then trained the rest of the ASSSET team in the Summer of 2021. The training has helped the mentors in the ASSSET program address the needs and concerns of the mentees enabling them to have better communication and both parties to feel heard.

### Customized curriculum for freshmen

Fall 2021 semester started with 12 ASSSET scholars from 5 engineering majors including Petroleum Engineering, Electrical & Computer Engineering, Mechanical Engineering, Chemical Engineering, and Industrial Technology. The 8 ASSSET freshmen enrolled in the "Fundamentals of Energy Technologies" which is a one credit pass/fail course. It was decided by the ASSSET Team to limit the course to only ASSSET scholars in the first year. After the initial year all engineering students would have the opportunity to take the class. The reason was to enable the STEM mentors to prepare the course's foundation with a lower number of students as the course was piloted. STEM mentors rotationally taught the course in Fall 2021 and covered the big picture of energy-related topics including renewable energy, oil/gas industry, control engineering, and cyber/physical security in energy systems.

### Coordination with the ASSSET's external evaluator

In the beginning of Fall 2021 semester ASSSET scholars completed a survey created by the program's external evaluator assessing three main psychological components, their intellectual mindset, their Empathizing Score, and their Revised Systemizing Score. The Empathizing and Systemizing scores were then combined to determine the participant's brain type. Mindset predict how amenable a person is to learning for the sake of learning. Those with a growth mindset are willing to learn from their mistakes and to seek knowledge for the sake of knowing. Those with a fixed mindset are more interested in learning to self-validate, and they do not have a high tolerance for learning from their mistakes or going the extra mile to learn something. They are more prone to give up. For those non-ASSSET scholars who volunteered to be part of the comparison group, we only assessed mindset. At the end of the Fall 2021 semester, we assessed how involved they were in their major, whether they dropped any classes that were part of their major and other questions assessing their involvement in their program of study, including their intention to remain in the major and their academic performance. The results of these surveys will be further discussed and included in the program's annual report after the Spring 2022 semester.

### Seminars and workshops

In Fall 2021, students participated in three (3) seminars. In the first seminar, the Director of UL Lafayette's Office of Sustainability discussed the importance of energy sustainability and how it impacts campus, and society in a larger scale. The second seminar covered Energy Audit with an emphasis on the State of Louisiana. A university professor with Mechanical Engineering background was the speaker. The speaker of the third seminar was the Associate Director of Safety and Mission Assurance in NASA Stennis Space Center who discussed the importance of STEM fields and more specifically energy technologies to keep United States competitive in space-related initiatives. The seminars were open to all College of Engineering students.

### Challenges

#### **1. COVID-19**

Education in K-12 and higher education has gone through once a generation revolution from 2020 to 2022. Many studies have shown students around the world lost over \$17 trillion in lifetime earnings during COVID-19 school closures [1,2]. One aspect of this revolution that has not been addressed and must be monitored is the return of students who used to online and Hyflex courses and studies to classrooms. We have noticed that many freshmen students in our program get bored and start looking around during lectures. It is possible this could be due to relax atmosphere when they stayed at home and attended classes on line or possibly the assumption that they have another four years these general information that are provided to them. We will survey students at the end of semester, May 2022, in this regard.

#### **2. Comparing ASSSET Participants and Other Students in College (Matching)**

One way to look at the progress of students in this program is to look at their progress and adaptation to college life with their fellow college mate in same field of engineering. Many students outside the program that are match to ASSSET do not want to participate as they feel it is a waste of time and no reward. This is a common problem these days as many institutes ask faculty and staff and students fill surveys after surveys.

### 3. Quality and Student Eligibility

Our institute defines low-income students as ones that are eligible for Pell Grants. Low-income students likely are less prepared for college and many score low in entrance exams such as ACT and SAT. Due to this many of them must take preparatory classes such as college algebra and trigonometry and this pushes back their graduation by up to three semesters. High school advisors and even university recruiters do not mention this to applicants. This task is falling to ASSSET team to break the news and make sure students are not discouraged and retain as engineering and technology majors. Studies done by UL Lafayette has shown only around 31% of engineering students with ACT score of 28 or lower graduate after five years according to 2017 and 2018 data. This is a great challenge for the ASSSET team to overcome.

### Results and Impacts

Halfway through 2021-22 Academic year a survey was conducted. The summary of students' feedback is as follows:

- Students liked to learn about other engineering departments.
- Maintain a 3.00 GPA to keep receiving the scholarship is an incentive to study hard.
- Students can work less and be more focused on coursework rather than off-campus jobs .
- Classes/meetings were informative not only about the program, but about advising and other things.
- Students are interested to know about the "business" side of the engineering.
- Students suggested setting up an end of semester gathering including trivia games and small prizes.
- Students suggested more engagement between students with activities, such as a group project.

Table 1. ASSSET Students performance in Fall 2021 at a glance

Student	Major in SP21	Major in FA21	GPA in SP21	GPA in FA21	Involvement in research	Standing
Freshman		PETE		2.81		N/A
Freshman		MCHE		4		President's List
Freshman		MCHE		3.33		N/A
Freshman		CHEM		3.83		Dean's List
Freshman		EECE		3.5		Dean's List
Freshman		EECE		3.62		Dean's List
Freshman		CHEM		3.5		Dean's List
Freshman		CHEM		1.6		N/A
Sophomore	MCHE	MCHE	4	4	Yes	President's List
Sophomore	EECE	EECE	3.91	3.88	Yes	Dean's List
Sophomore	ITEC	ITEC	3.11	3.08	Yes	N/A
Junior	EECE	EECE	3.72	3.7	Yes	Dean's List

Though the project is still in its first year, the following are some of its impacts:

- *Retention:* The project supported 12 students with financial need and academic promise. The students were engineering majors and included 8 freshmen, 3 sophomores and 1 junior. At the end of the project's initial year, all the students persisted in their majors. None of the cohorts changed major, thus ensuring 100% retention rate for our cohorts. Additionally, for the exception of one student, all S-STEM fellows maintained very good GPAs and good academic standing. One student did not approach any faculty for help. Continuous advising and checking with this student indicated that he was doing acceptable and well in all his courses. It seems his final exams grades were not satisfactory. This student is placed on academic probation and is allowed to continue his studies and repeat his failed courses. He can reapply for entry into the program.
- *Students' engagement in undergraduate research activities:* ASSSET sophomore and junior students started getting involved in research projects with faculty in the college of engineering. We expect these students to participate in research presentation/poster competition during the Engineering and Technology week that will be held in April 2022.
- *Increased knowledge about energy technology:* The SSTEM fellows have reported increased knowledge about energy technology, its relevance and impact in the society

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### References

[1] Azevedo, Joao Pedro Wagner De; Rogers, F. Halsey; Ahlgren, Sanna Ellinore; Cloutier, Marie-Helene; Chakroun, Borhene; Chang, Gwang-Chol; Mizunoya, Suguru; Reuge, Nicolas Jean; Brossard, Matt; Bergmann, Jessica Lynn. *The State of the Global Education Crisis : A Path to Recovery* (English). Washington, D.C. : World Bank Group.  
<http://documents.worldbank.org/curated/en/416991638768297704/The-State-of-the-Global-Education-Crisis-A-Path-to-Recovery>.

[2] Gema Zamarro, Andrew Camp, Dillon Fuchsman, and Josh B. McGee, How the pandemic has changed teachers' commitment to remaining in the classroom,  
<https://www.brookings.edu/blog/brown-center-chalkboard/2021/09/08/how-the-pandemic-has-changed-teachers-commitment-to-remaining-in-the-classroom/>