Assistive Technology Lab At Shri Vishnu Engineering College For Women- Igniting Young Minds For Innovation

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Abstract- Assistive Technology is any object or system that increases or maintains the capabilities of people with disabilities. Of late, assistive technology meant to help physically or mentally challenged and elderly people is gaining rapid attention and started making progressive strides towards research and development. Keeping track with growth in research in developing assistive technology gadgets, an innovation lab called Assistive Technology Lab (ATL) is established at Shri Vishnu Engineering College for Women, Andhra Pradesh, India. This paper provides a detailed description of the transformation that Assistive Technology Lab (ATL) brought in the students and faculty members of Shri Vishnu Engineering College for Women (SVECW) in terms of innovation and also in terms of molding themselves as human beings with empathy towards challenged people in the society.

Key Words: Assistive technology, Innovation, ability, challenged, SVECW, ATL

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1. Introduction

Assistive Technology is any object or system that increases or maintains the capabilities of people with disabilities [1]. Of late, assistive technology meant to help physically or mentally challenged and elderly people is gaining rapid attention and started making progressive strides towards research and development.

There are a few labs around the world which are working for development of assistive technology devices for the differently abled people. A lab is designed to support both students who are pursuing degrees in the area of assistive technology and students and employees with disabilities at George Mason University [2]. The assistive technology lab at University of Alaska is working on testing and demonstration of accessibility software [3]. The assistive technology lab at Utah State University is providing assistive technology related research and product development for the people in its vicinity [4]. The Biomechanics and Assistive Technology lab at Vanderbilt school of Engineering is making assistive products related to locomotive disability [5].

But, on the other side, not many academic research centers in India are focusing towards research in assistive technology and rehabilitation engineering. But, assistive technology is the need of the hour and the engineering students who are doing their under graduation course must be motivated towards development of assistive gadgets for needy people.

This not only inculcates the spirit of innovation in them but also develops a responsibility towards serving the society. This paved way for the establishment of Assistive Technology Lab (ATL) at Shri Vishnu Engineering College for Women, in Andhra Pradesh, India. This lab is established in technical collaboration with University of Massachusetts, Lowell, USA in 2009

ATL initiated with an aim of providing a rich, authentic learning experience for students. It is intended to be a real time platform for the students to learn and experience engineering design process, to apply their academic skills in a real-world context, and to develop important work place skills not usually taught in the classroom. Since the time of its inception ATL has undergone many metamorphoses to make strong minded students who are determined to serve the society by means of their technology.

The objectives of Assistive Technology Lab are laid down and are described as follows:

1. To make young minds ignited for innovation
2. To Engineer solutions for societal cause
3. To identify and develop new assistive products for the clients
4. To identify projects suitable for patenting and commercialization
5. To undertake joint projects with international institutions and industry
6. To Introduce interdisciplinary thinking among the students

This paper aims at providing a detailed description of the transformation that ATL brought in the students and faculty members of Shri Vishnu Engineering College for Women (SVECW) in terms of innovation and also in terms of molding themselves as human beings with empathy towards challenged people in the society.

The first section of the paper gave a brief description of various assistive technology labs across the globe along with an introduction of ATL at SVECW. The rest of the paper is organized as follows: Section II describes the practices followed in ATL SVECW, section III presents the outcomes from assistive technology lab since 2009, and also provides the comparison of the academic performance of the students involved in ATL in the past six years and finally, section IV concludes the paper.

2. The Practice

The Assistive Technology Lab (ATL) at Shri Vishnu Engineering College for Women (SVECW), Bhimavaram, W. G. Dt., Andhra Pradesh is a vision of Shri K. V. Vishnu Raju, the Chairman of Sri Vishnu Educational Society, to utilize the skills of every engineering department of the college for the development of Assistive Technology. It was set up in 2009 and works in collaboration with University of Massachusetts (UMass), Lowell, USA. Assistive Technology Lab works for a very unique and a noble cause of designing projects by the students of SVECW to benefit the differently-abled. This is a small but definite step to mainstream people with disabilities into society. Professor Alan Rux, who runs the Assistive Technology Program at the University of Massachusetts, Lowell, USA, visits SVECW every year in the month of July and guides students in developing projects related to Assistive Technology. Fig.1 provides an illustration of how Prof. Alan Rux guides the students in making the projects.
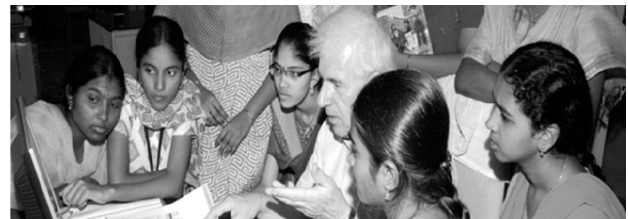

Fig.1: Prof. Alan Rux with Students

The initial step in making assistive technology projects is selection of students. The students are selected from various disciplines of engineering in the college. Then, they are grouped into teams with each member of the team belonging to a different discipline. As the project teams are interdisciplinary, the role of each student is also decided at this stage. For instance the student from Computer Science and Engineering acts as a programmer, the one from Electronics background is hardware engineer, the electrical engineering student takes care of power budget and designing and implementation of actuators in the project while the student from mechanical engineering discipline takes care of the physical design and outer case construction of the project.

However, all the students in the team should have knowledge of every discipline in order to coordinate properly with other members of the team. So, a bridge course is given for them to teach them the basic

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concepts of various disciplines. The bridge course is designed as given in Table I.

Table 1: Details of Bridge Course

S. No.	Course
1.	Project Development -1
2.	Basics of Electronics -1
3.	Basics of Digital Electronics
4.	Basics of Electrical Engineering -1
5.	C-Programming
6.	Embedded C - Programming
7.	Overview of Microcontrollers -1
8.	Hands on Proteus
9.	Hands on Eagle
10.	Hands on Fritzing
11.	Hands on MPLAB IDE
12.	Hands on Auto-CAD
13.	Hands on Solid Edge
14.	Hands on 3 -D Printing

The next step in the process of project making is to interact with the clients to understand their difficulties. Therefore, the highly motivated group of students under the efficient guidance of their faculty mentors visits old age homes and a number of schools for physically and mentally challenged people in the neighborhood

Some of our clients are listed below:

1. Center for Visually Challenged,Bhimavaram

2. Sri Venkateswara Deaf School, Bhimavaram

3. Arunodaya Mano vikasa Kendram, Bhimavaram

4. Anjali School for Physically and Mentally Challenged, Palakollu

5. Andhra Blind School, Narsapuram

6. Devanar Blind School, Hyderabad

7. Sri. Thabitha Old Age Home, Bhimavaram

8. Zion Residential School for Visually and Physically Challenged, Rajahmundry

After the client visit the students divide themselves into small groups for discussing the problems that were expressed by the challenged people during their client visit. Then they consolidate all their ideas for solving the problems of their clients. This is followed by a brainstorming session with the faculty mentors to finalize their ideas into projects for developing assistive gadgets for the needy people.

The faculty mentors act as stabilizers and help students identify most relevant and feasible solutions for the problems. The students work within a budget, analyze the cost of various design alternatives, and finally, make a project proposal outlining their design work and final solution.

This is the initial phase of the project development process. In the next phase of development, the students burn midnight oil to make their ideas come into their hands and finally reach the end user. They have weekly project reviews not only with the faculty mentors of our institution but they also have video conferencing with Prof. Alan Rux, UMASS Lowell, USA to go in the right direction to reach their goal.

Fig.2: Glimpses of Client Visit

Fig.3: Students' Project Proposal Presentations

After completing the project, field tests are carried out by taking the project prototype to the client. Based on the comments and suggestions given by the client, the project is refined time and again until the client is satisfied about the performance of the project. This whole process makes the student go tough and makes her ready to face difficult situations.

Fig.4: Students' Discussion with Prof. Rux

Of course, the ultimate goal of ATL projects is to distribute them to the respective clients on December 3rd every year. December 3rd happens to be International day of people with disabilities as declared by United Nations. So, during the past five years more than 150 items have been distributed by the management, Sri Vishnu Educational Society, Bhimavaram for the needy people. It started with a small step in 2010 and today we are getting requests for our ATL projects from all over the state of Andhra Pradesh.

Fig.5: Distribution of ATL Projects

In this section a detailed description of the procedures involved in making assistive technology projects at SVECW is given. In the next section the outcomes of practicing AT in our institution are presented.

3. Outcomes of ATL

The outcomes of ATL at SVECW are measured on the basis of four parameters: the number of successfully completed projects, the number of projects distributed to the clients after quality check, the number of prizes and awards won by the students and finally the number of students placed in reputed companies.

A. Successfully Completed Projects

Though a number of projects are identified at the commencement of AT course in the academic year, only a few projects were successfully completed in the beginning years of assistive technology at SVECW. The important reason for this is that the projects are not reviewed for their progress. After identifying this flaw, proper layout is formulated to review the progress of the projects. The first reformation was to provide a laboratory notebook for the students. The students record their day's work in that record. The recorded data may include: literature survey, study of data sheets of various components, design of circuit diagram, calculations, experiments, the difficulties faced by them, the code of their project and so on. Then, a time schedule is framed for them which direct them to finish a specified task in a stipulated amount of time. The next policy followed is to conduct weekly design reviews to monitor the progress of the project. The design reviews are conducted in two ways. During the first week, the faculty mentors of SVECW reviewed the progress and during the next week Prof. Alan Rux monitored the progress through video conference. As the students are giving a presentation of their projects four times in a month and are able to face critical design reviews they could get a thorough knowledge of their project. The design review meetings also helped them to think out of the box and come up with an innovative solution each time they are pricked by a question from their mentors. They are also made to submit interim reports of their projects. These interim reports helped them to improve their documentation skills also.

The strategies worked fine and slowly a progress has been made in increasing the number of successfully completed projects. The statistics of successfully completed student projects from 2009-2014 is given in Table II

Table 2: Statistics of Successful Students' Projects

Academic Year	No. of Identified projects	No. of Completed Projects	Success Rate
2009-10	8	5	62.5%
2010-11	10	5	50%
2011-12	10	6	60%
2012-13	10	9	90%
2013-14	9	9	100%
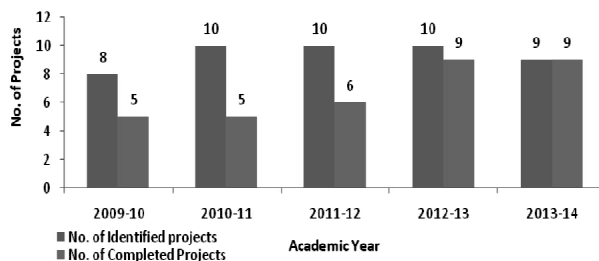
Fig.6: Statistics of Successful Students' Projects

**B. ATL Projects Distribution on International Day of People with Disability**

International day of people with disability is a United Nations sanctioned day that aims to promote an understanding of people with disability and encourage support for their dignity, rights and well-being. On this occasion every year on December 3rd, the management of Sri Vishnu Educational Society is donating assistive technology projects to the required clients. The details of projects distributed by the management of Sri Vishnu Educational Society from 2009 to 2014 are given in Table II.

From Table II it is observed that the number of ATL projects distributed to the clients slowly increased from 2009 and attained a maximum of eight varieties in 2014. The numbers shown here are the varieties of projects distributed. Since 2009, about 100 E-Sticks, Three Hand Grippers, Three Gait Trainers about ten learning aids for visually challenged have been distributed for the clients. Therefore, more than one hundred and fifty projects have been given away to the clients till 3rd December 2014.

Table 3: ATL Project Distribution Statistics

S. No.	Academic Year	Projects Distributed
1.	2009-10	nil
2.	2010-11	6
3.	2011-12	5
4.	2012-13	6
5.	2013-14	8

The statistics of ATL project distribution is shown in Fig.7.
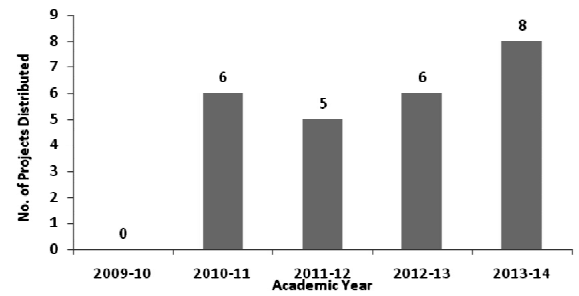
Fig.7: ATL Project Distribution Analysis

C. Student Achievements

Owing to the rigorous training in terms of design reviews, client visits and field tests that is imparted to the students, the students developed a lot of confidence, presentation skills and professional attitude towards life. These attributes made the students involved in ATL stand out of the box and made them leaders. They received lot of accolades, awards and rewards wherever they presented their projects.

The students of Assistive Technology Lab at SVECW presented their projects at several International conferences organized by premier academic institutions and industries. Some glimpses of the project exhibitions are shown in Fig.8.

The Fig.8 shows the glimpses of Techshare 2012, an International conference organized by Barrier Break Technologies. The theme of the conference was to empower the visually challenged people. Our students stole the hearts of the conference and received a standing ovation from the audience in appreciation of the projects show cased by them.

Fig.8: Project Exhibition at Techshare 2012

A group of 12 students accompanied by three faculty members participated in 10th India Innovation Summit-2014 at Bangalore. The summit was organized by Confederation of Indian Industry (CII). In this summit there is an opportunity for not only showcasing our ATL projects but also for getting a chance to meet various eminent industrialists and

innovators in different sectors. This expo is definitely a good learning experience for both the accompanying faculty members and the students. Some of the glimpses of the expo are shown in Fig.9.

Fig.9: CII Conference at Bangalore

The students also received so many awards and prizes vying with premier academic institutions of India. One of the student teams received the third prize and a cash award of worth 2,500 US Dollars in Analog Design Contest 2010 organized by Texas Instruments, India. They stood among the top three in the Innovation Jockeys Contest jointly organized by Yahoo and Accenture, India. They bagged second prize in the annual IT product awards given by ITsAP organization in the category "social cause". The list goes on. Some of the awards taken by the students are shown in Fig.10.

Fig.10: Awards and Achievements of ATL

The exposure to several project contests, international conferences, project expos organized by industry and premier academic institution has made the students be ready for employment in any type of industry. This is illustrated by the statistics given in Tables IV and V.

Table 4: Placement Analysis till 2013

Academic Year	No. of Students Admitted	No. of Students Placed
2013-14	9	7
2012-13	21	12
2011-12	6	1

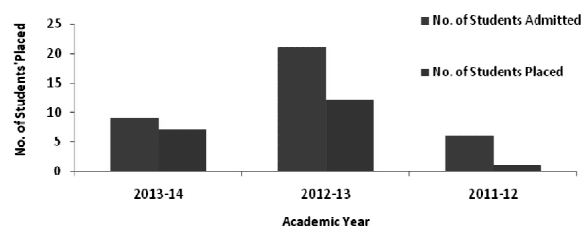A graph is plotted for the above analysis and is shown in Fig.11.

Fig.11: Placement Analysis till 2013-14

The same analysis is done for the academic year 2014-15 also and the details are given in Table V. The graph plotted for the analysis given in Table V is shown in Fig.12.

From the Table IV and Table V it is clear that there is a lot of improvement in placements of the students. Instead of being placed in a single company, they are being placed in multiple numbers of companies including core manufacturing companies in all disciplines of engineering.

Table 5: Placement Analysis of 2014-15

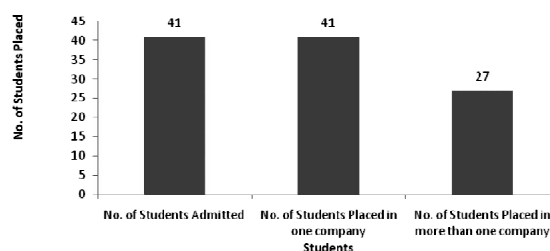| Academic Year	No. of Students Admitted	No. of Students Placed in one company	No. of Students Placed in more than one company
2014-15	41	41	27

Fig.12: Placement Analysis for the Year 2014-15

Thus, the students are showing all round improvement in their character by way of innovating new gadgets, show casing them participating in several apex competitions and finally by distributing them to the needy persons. As they say "The fruits of hard work are always sweet", the ATL students are being placed in reputed industries. It is also understood that upon the completion of the project work the student will be able to

1. Apply the knowledge of engineering fundamentals

2. Identify, formulate, research literature and analyze complex engineering problems

3. Select and apply appropriate resources and modern engineering and IT tools

4. Work as an individual and in team

5. Manage project and finance.

All of the above mentioned outcomes are the graduate attributes as suggested by ABET. In future a survey may be conducted among the students who successfully completed the projects in order to analyze the above mentioned outcomes

4. Conclusion

From the discussion made so far it is clearly understood that the Assistive Technology Lab at Shri Vishnu Engineering College for Women is one of the best practices in the institution and is definitely striving hard not only for igniting the young minds for innovation but also for their all round development as good citizens and above all good human beings.

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