

Self-efficacy among the students of biological sciences at Cuddalore district, TN, India

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Abstract

Integration of information technology is inevitable in day-today-life including teaching-learning process. Measurement of technology efficacy using appropriate instruments may provide a useful indicator of the effects of students' initiatives intended for better technology use. Firstly, students should possess technology efficacy to meet out the demands of the upcoming society without which the art of education would never attain its completeness. From this perspective, students are capable of influencing their own motivation and performance according to a model of triadic reciprocity in which personal determinants such as self-efficacy; environmental conditions and action are mutually interactive influences. Undoubtedly, it is the need of the hour that the students of undergraduate level are expected to update their knowledge and equipmentation skills. Henceforth, the investigator decided to conduct a study pertaining to this area. The problem selected for the study is stated as self-efficacy among the students of biological sciences at Cuddalore district of Tamil Nadu in India. Self-efficacy has been defined as individuals' attitude about their performance capabilities in a particular domain. Self-efficacy beliefs influence on the choices individuals make and the courses of action they trail. An individual's sense of self-efficacy is also related to achievement goals, attributions, self-regulation and option. It is concluded that the medium of instruction, gender difference and the community did not affect the self-efficacy in equipmentation among the biology students of the study area but certain educational institutional environment influenced positively. The outcome of this study may help the educational managers to identify those factors that are capable of influencing the learning process in a better way.

Keywords: Biology, Cuddalore, education, gender, instructional medium, information technology, science, self-efficacy,

Introduction

Education is a constant process of development of innate powers of man. In fact, education promotes the harmonious growth of physical, mental, spiritual and moral, intellectual, aesthetic, cultural and social faculties of a person. In other words, education is the progressive changes of a person, in knowledge, attitudes and behaviour as a result of formal instruction and study. It is the development of a person resulting from experience rather than from maturation. Self-efficacy has been defined as individuals' attitude about their performance capabilities in a particular domain. Self-efficacy beliefs influence on the choices individuals make and the courses of action they trail. An individual's sense of self-efficacy is also related to achievement goals, attributions, self-regulation and option.

Bandura's (1986, 1993 & 1997) theory of self-efficacy has important implications with regard to motivation. Bandura's basic principle is that students are likely to engage in activities to the extent that they perceive themselves to be competent at those activities. The students who can act with the sense of self-efficacy only could succeed and achieve more and more as the faithful contributors and suppose to be the real builders of the nation.

Self-efficacy is defined to be the belief in one's effectiveness in performing specific tasks. People who regard themselves as highly efficacious act, think, and feel differently from those who perceive themselves as

inefficacious. They produce their own future, rather than simply foretell it (Bandura, 1986).

Self-efficacy theory

Bandura (1978) defined self-efficacy as a judgment of one's ability to execute a particular behaviour pattern. Wood and Bandura (1989) expanded upon this definition by suggesting that self-efficacy beliefs form a central role in the regulatory process through which an individual's motivation and performance attainments are governed. Self-efficacy judgments also determine how much effort students will spend on a task and how long they will persist with it. Students with strong self-efficacy beliefs exert greater efforts to master a challenge while those with weak self-efficacy beliefs are likely to reduce their efforts or even quit (Brown & Inouyne, 1978; Weinberg *et al.*, 1979; Bandura & Schunk, 1981; Schunk, 1981). From this perspective, students are capable of influencing their own motivation and performance according to a model of triadic reciprocity in which personal determinants such as self-efficacy; environmental conditions and action are mutually interactive influences. Improving performance, therefore, depends on changing some of these influences. Pedagogically, the challenge is: to get the learner to believe in his or her personal capabilities to successfully perform a designated task; to provide environmental conditions, such as instructional strategies and appropriate technology, that improves the strategies and self-efficacy of the learner and to provide opportunities for the learner to experience successful learning as a result of appropriate action.

Validation of the efficacy scale

This study provides a brief history of the online environment and discusses the development and validation of an instrument that measures online students' self-efficacy beliefs with course content and communication technologies such as email, Internet and computer conferencing. Content validity, construct validity and reliability were established in order to validate this instrument. Correlation analysis indicated that Cronbach's coefficient Alpha for course content technology efficacy and online technologies technology efficacy were 0.87

and 0.90 respectively. In India, Swathantra Devi and Vincen De Paul could emerge with an appropriate tool for assessing the technology efficacy of teachers namely teachers equipmentation efficacy scale (TETES).

Hypotheses of the study

The hypotheses framed for the present study include: 1. There is no significance difference in the self-efficacy among the biology students of Cuddalore with respect to gender, 2. There is no significance difference in the self-efficacy among the

Table 2. Significance of difference in self-efficacy in equipmentation among the biology students of Cuddalore with respect to their gender.

Gender	N	Mean	SD	T	df	Remarks
Male	134	213.57	18.28	1.286	438	Not significant
Female	306	216.05	18.82			

Methodology

In this study the investigator has adopted the survey method of research. The study has been conducted at 5 stages. In the first stage the tool developed by Swatantra Devi and Vincent De Paul namely teachers

Fig. 1.

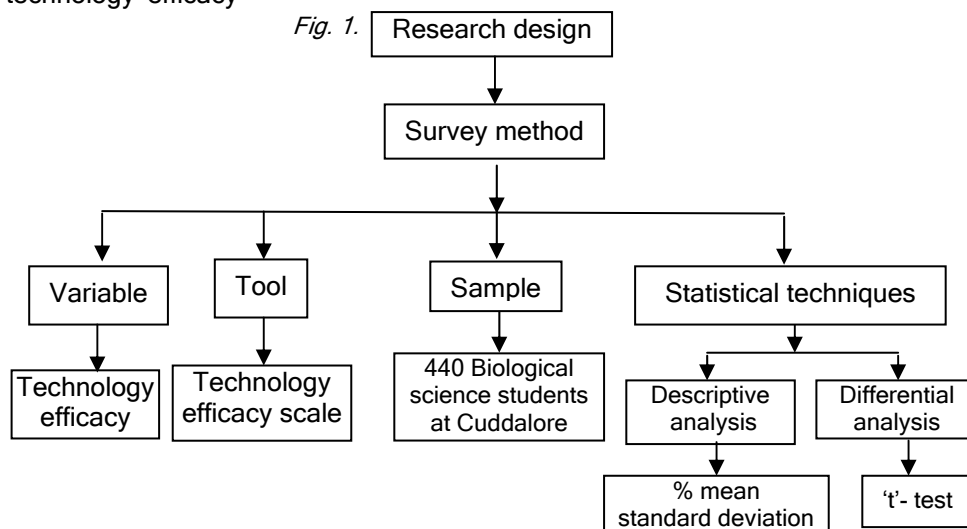


Table 1. Distribution of sample.

Variables		Division	Sample size	Total
Gender		Male	134	440
		Female	306	
College		Periyar arts & science	120	440
		KNC	170	
		St. Joseph's	150	
Major subject	Traditional subjects	Botany	100	440
		Zoology	100	
	Modern subjects	Microbiology	120	
		Biotechnology	120	
Medium of instruction in UG		English medium	233	440
		Tamil medium	207	
Community		FC	30	440
		BC & MBC	362	
		SC & ST	48	

biology students of Cuddalore with respect to their colleges, 3. There is no significant difference in the self-efficacy in equipmentation among the biology students of Cuddalore with respect to their major subject namely, botany, zoology, microbiology and biotechnology, 4. There is no significant difference in the self-efficacy in equipmentation among the biology students of Cuddalore with respect to their medium of instruction in under graduation and 5. There is no significance difference in the self-efficacy in equipmentation among the biology students of Cuddalore with respect to their community.

equipmentation efficacy scale (TETES) has been identified and selected to assess the technology efficacy of biology students at Cuddalore. In the second stage a pilot study was conducted with 10 biology students. In the third stage, the tool was administered to the randomly selected 3 arts and science colleges situated at various locations of Cuddalore. In the fourth stage the data was analyzed. The 5th stage was the documentation of the results of the study (Table 1).

Limitations of the study

The present study was restricted to the biology students of Cuddalore only. The present study was restricted to the 5 domains of technology efficacy, they are: Not heard, Heard, Knew, Used/Produced and Explained to others

Research design

To study the technology efficacy of biological science students at Cuddalore, Random sampling technique has been used to collect the data by the investigator (Fig. 1).

Analysis and interpretation of data

Hypotheses testing: The framed hypotheses were tested by applying 't' test and 'F' test depending upon the variables. Significance of difference in self-efficacy in equipmentation among the biology students of Cuddalore with respect to their gender (Table 2). The calculated t value 1.286 is less than the table value 1.97 for df=438 at 0.05 level of significance. Hence the null hypothesis that there is no significance difference in the self-efficacy in equipmentation among the biology students of Cuddalore with respect to gender is accepted.

Interpretation: It is concluded that the self-efficacy in equipmentation of boys and girls is almost equal among the biology students of Cuddalore.

The calculated F value 24.941 is greater than the table value 3.83 for df (3,436) at 0.01 level of significance. Hence the null hypothesis that there is no significance difference in the self-efficacy in equipmentation among the biology students of Cuddalore with respect to their colleges is rejected at 0.01 level of significance (Table 3).

Table 3. Significance of difference in the equipmentation efficacy among the biology students with respect to their colleges (ANOVA summary).

	Sum of squares	Df	Mean square	F	Remarks
Between groups	22415.263	3	7471.754	24.941	Significant at 0.01
Within groups	130616.328	436	299.579		
Total	153031.591	439			

Interpretation: It is concluded that biology students of Cuddalore differ significantly in their self-efficacy in equipmentation with respect to their colleges they are studying.

Table 4. Significance of difference in self-efficacy in equipmentation among the biology students.

College	N	Mean	SD	t	df	Remarks
St. Joseph's	120	224.73	21.78	3.838	230*	Significant at 0.01
K.N.C	120	214.81	18.12			

* Equal variance not assumed.

The calculated t value 3.838 is greater than the table value 2.60 for df=230 at 0.01 level of significance. Hence the null hypothesis that there is no significant difference in the equipmentation efficacy among the biology students of St. Joseph's arts and science college and Kandasamy Naidu arts and science college is rejected at 0.01 level of significance (Table 4).

Interpretation: It is concluded that the self-efficacy in equipmentation among the biology students of St. Joseph's Arts and Science College is significantly higher than that of the biology students of Kandasamy Naidu arts and science College.

Table 5. Significance of difference in the self-efficacy in equipmentation among the biology students.

College	N	Mean	SD	t	df	Remarks
St. Joseph's	120	224.73	21.78	3.830	207*	Significant at 0.01
Periyar	100	215.37	14.22			

* Equal variance not assumed.

The calculated t value 3.830 is greater than the table value 2.60 for df=207 at 0.01 level of significance. Hence the null hypothesis that there is no significant difference in the self-efficacy in equipmentation among the biology students of St. Joseph's Arts and Science College and Periyar Arts and Science College is rejected at 0.01 level of significance (Table 5).

Interpretation: It is concluded that the self-efficacy in equipmentation among the biology students of St.

Joseph's Arts and Science College is higher than that of the biology students of Periyar Arts and Science College. The calculated t value 0.257 is less than the table value 1.97 for df=217 at 0.05 level of significance. Hence the null hypothesis that there is no significant difference in the self-efficacy in equipmentation among the biology students of Kandasamy Naidu Arts and Science College and Periyar Arts and Science College is accepted at 0.05 level of significance (Table 6).

Table 6. Significance of difference in the self-efficacy in equipmentation among the biology students.

College	N	Mean	SD	t	df	Remarks
K.N.C	120	214.80	18.12	0.257	217*	Not significant
Periyar	100	215.37	14.22			

* Equal variance not assumed.

Interpretation: It is concluded that the self-efficacy in equipmentation of the biology students of Kandasamy Naidu Arts and Science College and Periyar Arts and Science College is almost equal without any great variation.

The calculated t value 9.789 is greater than the table value 2.59 for df=410 at 0.01 level of significance. Hence the null hypothesis that there is no significant difference in the self-efficacy in equipmentation among the biology students of Cuddalore with respect to their major subject namely, traditional subjects group and modern subjects group is rejected at 0.01 level of significance (Table 7).

Table 7. Significance of difference in the self-efficacy in equipmentation among the biology students with respect to their major subject.

Major	N	Mean	SD	t	df	Remarks
Traditional subjects group	173	205.77	15.22	9.789	410	Significant at 0.01
Modern subjects group	267	221.46	18.12			

Interpretation: It is concluded that among the biology students of Cuddalore, the self-efficacy in equipmentation of the modern subjects group is higher than that of the traditional subjects group.

The Calculated t value 0.783 is less than the table value 1.97 for df=438 at 0.05 level of significance. Hence the null hypothesis that there is no significant difference in the self-efficacy in equipmentation among the biology students of Cuddalore with respect to their medium of instruction in under graduation is accepted at

Table 8. Significance of difference in the self-efficacy in equipmentation among the biology students with respect to their medium of instruction.

Medium in UG	N	Mean	SD	t	df	Remarks
English medium	233	215.95	18.32	0.783	438	Not significant
Tamil medium	207	214.56	19.07			

0.05 level of significance (Table 8).

Interpretation: It is concluded that the biology students of Cuddalore, do not significantly differ in their self-efficacy in equipmentation with respect to their medium of instruction in the under graduation. The medium of

instruction in their under graduation has not influenced the biology students any way to differ in their self-efficacy in equipmentation and hence the variable medium of instruction in the under graduation is not significant.

Table 9. Significance of difference in the self-efficacy in equipmentation among the biology students with respect to their community (ANOVA summary).

	Sum of squares	df	Mean square	F	Remarks
Between groups	1672.172	2	836.086	2.414	Not significant
Within groups	151359.419	437	346.360		
Total	153031.591	439			

The calculated F value 2.414 is less than the table value 3.02 for df (2, 437) at 0.05 level of significance. Hence, the null hypothesis of no significant difference in the SEBS of Cuddalore with respect to their community is accepted at 0.05 level of significance (Table 9).

Interpretation: It is concluded that biology students of Cuddalore do not differ significantly in their self-efficacy in equipmentation with respect to their community.

Summary

The self-efficacy in equipmentation of boys and girls is almost equal among the biology students of Cuddalore. They differ significantly in their self-efficacy in equipmentation with respect to their colleges they are studying. The self-efficacy in equipmentation among the biology students (SEBS) of St. Joseph's Arts and Science College is significantly higher than that of the biology students of Kandasamy Naidu Arts and Science College. It is concluded that the self-efficacy in equipmentation among the biology students of St. Joseph's arts and science college is higher than that of the biology students of Periyar arts and science college. SEBS of Kandasamy Naidu Arts and Science College and Periyar Arts and Science College is almost equal without any great variation. SEBS of the modern subjects group is higher than that of the traditional subjects group. SEBS does not significantly differ with respect to the medium of instruction and community base.

Conclusion

Today our society expects the integration of information technology into the daily practices including in the classroom obviously. It will become increasingly important that all Students are adequately prepared for this dimension of their professional practice. Researchers suggest that a self/technology efficacy belief about using technology for studying is directly related to practice. Measurement of technology efficacy using appropriate instruments may provide a useful indicator of the effects of students initiatives intended to better technology use. The best results appear to come from software, classroom and Laboratory materials that are derived by students in practice.

If biological science education programs are to be effective at increasing students' capability for integrating technology, then decisions about the structure and content of those courses need to be based upon an understanding of the factors which contribute to

successful technology integration. It may also be possible to identify one or more measures which are directly influenced by experiences in biological science education and which, in turn, predict success at technology integration either directly or through their influence on other factors. Such measures would be especially helpful in the design and evaluation of Biological Science education programs where one of the challenges is to make decisions which are implemented immediately while accepting that the ultimate effects of those decisions may not become apparent until some years after graduation.

Therefore, immediate steps should be taken to enhance self-efficacy in equipmentation among the biological science students to improve their standard learning situations. Hence steps should be taken to sustain and improve further on the aspects of self-efficacy in equipmentation among the students of biological science.

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