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A Study On Relevance Of Student's Attitude, Implementing An Interdisciplinary Approach In a Post Graduate Program.

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ABSTRACT

In today's scenario most of the programs are interdisciplinary in nature. A very few 'curriculum models' are in place in the bibliography record to study the impact and implementation style. One such curriculum model SRU-2011 was implemented in the center identified and the output was reviewed. The usual problems related to Inter - Disciplinary Programs are unrelated subjects, growth of new fields of study, selection of different subjects, different impacting methods, student's impact and attitude issues. Of the above mentioned issues we found that a correlation exists between attitude related issues and student placement results. The outcome of these results and other related issues have been discussed.

KEYWORDS

Bioinformatics, Interdisciplinary, Curriculum Design, Attitude, Placements.

1.0 HIGHLIGHTS

Over a period of time several academic disciplines have become more interdisciplinary rather than stagnate as unidisciplinary ones. Bioinformatics is emerging and practised as, one such 'typical interdisciplinary academic discipline'. The interdisciplinary program chosen for this study is the PG program - M.Sc. (Bioinformatics) in the Department of Bioinformatics at Sri Ramachandra University, Chennai, Tamilnadu, India. We have implemented, the SRU model (Published curriculum model) for the curriculum development, the purpose of this model is of the interactions of various Academic-components in a system, the experimental techniques that most suit systems biology approach are those that are system - wide. The admission details (their undergraduate field of study/entry level skills) and the results of their placement had been studied for the students of the M.Sc. (Bioinformatics) course for 5 consecutive batches have been studied in the Department of Bioinformatics at Sri Ramachandra University, Chennai, Tamilnadu, India for the time period between 2004 -2008. Research shows that the Study centre where SRU Model has been implemented is stable with reference to

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producing an interdisciplinary science for a 5 year period as it is found to be very flexible. The choice of the career of students which is an exhibition of their attitude towards placement could be a result of the consequential reasoning. At this juncture, we were able to identify the individual components (Attitude related issues like Subjects, teacher's influence, Peer influence, Opportunity Trend influence, Attitude, Student's influence).

1.1 Science: In the pursuit of knowledge, academic institutions classified sciences as physics, chemistry, mathematics and computer science and so on, called by the generic name of pure sciences. In course of time, it was realised that such compartmentalisation was found to be meaningless and interdependence was not only desirable, but unavoidable. In other words, study of pure academic disciplines has been replaced by study of interdisciplinary disciplines. Academic Disciplines can be broadly classified into two major groups - Pure Sciences and Interdisciplinary branches, on the basis of their scope of delivery / practised in Colleges, and Universities.

1.2 Pure sciences: They are also be called 'Uni-disciplines'. Over a period of time, several academic disciplines have become more interdisciplinary rather than stagnate as unidisciplinary ones. Bioinformatics is an emerging and practised as, one such 'typical interdisciplinary academic discipline'.

1.3 Uni-disciplinary Science:

The 'uni-disciplinary' science approach is applied to wildlife can have minimal impact on conservation. This is because conservation can be likened to a complex jigsaw puzzle, where the puzzle pieces are issues, stakeholders or scientific disciplines themselves. It is unlikely that any single discipline (reproductive biology, genetics, nutrition) could be the sole key to solve a particular conservation jigsaw puzzle.[1] Subjects like Mathematics, Physics, Chemistry, and Biology, are considered as unidisciplinary in nature. Hence, these are also called as pure sciences. The advantages of unidisciplinary sciences are as follows.

(a) Focus and undivided attention is possible. (b) Research and Development in the chosen field is faster. (c) New discoveries or patents are possible.

However, in spite of the advantages, there are some disadvantages too. They are as follows. (a)Research in related subjects becomes difficult.(b) As these subjects have evolved over a period of time and newer fields of study emerge, the scope for research in these uni- disciplinary subjects have got diluted.(c)In addition to this, Research and Development in unidisciplinary subjects become difficult as over a period of time, its growth becomes stunted and future discoveries and innovations get diluted.

1.4 Interdisciplinary Sciences: As specialisation became necessary newer subjects like Integral mathematics, Computer Science, Biotechnology and Bioinformatics which are truly interdisciplinary came into existence. According to a definition created by the National Institutes of Health (http://www.nih.gov/), Bioinformatics is research, development, or/and application of computational tools and approaches for expanding the use of biological,

medical, behavioural or health data, including those to acquire, store, organize, analyze, or visualize such data[2].Bioinformatics is a relatively new interdisciplinary field that integrates computer science, mathematics, biology, and information technology to manage, analyze, and understand biological, biochemical and biophysical information[3].Bioinformatics is a multifaceted discipline combining many scientific fields including computational biology, statistics, mathematics, molecular biology, and genetics[4].Bioinformatics allows researchers to open new windows of insight into our genetic makeup, providing pathways to understanding disease processes and creating novel diagnostic and treatment strategies[5].The field of bioinformatics will continue to evolve through the incorporation of diverse technologies and methodologies that draw experts from disparate fields to create the latest computational and informational tools specifically design for the biomedical research enterprise.[6]

1.5 Emergence of interdisciplinary Sciences & its Relevance: Today it is recognised that we can no longer rely upon uni-disciplinary solutions for our most pressing geo-problems. The hard problems require multiple perspectives and kinds of expertise. This is reflected in the names and activities of organizations and journals[7].

The advantages of interdisciplinary sciences are as follows. 1. More number of related subjects can be included.2. A student of an interdisciplinary science becomes a truly multi-skilled person. 3. When a student wants to narrow his field of specialisation, studying a science which is truly inter-disciplinary is useful.4. More and more new areas for research and development are identified like Bioinformatics, Biomedical Engineering, Nano Metallurgy and so on.5. The true advantage of a multidisciplinary science is that the student can specialise in their own area (subject studied in graduation level) or the new multidisciplinary science (subject studied in post- graduation level).

The disadvantages of interdisciplinary sciences are as follows. 1. The first disadvantage is that there are too many subjects to be taught and hence we require more skilled faculty and resources. 2. The design of the curriculum design is difficult. The suggested framework implies a layered information structure of the content consisting of three layers, each capturing a different aspect of the information space — conceptual, resource related, and contextual.

3. Infra-structure bottlenecks will result as there are many subjects to be handled and classrooms and other resources might be a problem. 4. The course delivery method is difficult to decide as to the student has to be taught the theory and practical application of the subjects is yet to be decided as an effective method of delivery.5. The basic skills of students are lacking in certain subjects as they are studying totally new subjects but they are able to do well in the subjects which they have studied in graduation. Hence, the bridge courses are essential.

1.6 Bridge courses: Bridge courses are being tried out in order to prevent students from doing badly in certain subjects. The bridge courses are meant to teach graduate level material. These bridge courses were useful to the students without strong back ground in Biology or Mathematics. Such students often have high levels of skill, but lack some of the background knowledge that the other students have[8].

1.7 Issues pertaining to Layering of Subjects: Conceptualization can support topical finding of resources and learner's understanding of the specific subject domain (by enabling exploration of related domain concepts).Subject domain conceptualization has been long used for knowledge representation in intelligent tutoring systems (ITS). More recently, concept structures play a central role in Adaptive Hypermedia (AH) applications for content fragmentation and structuring, and in a concept-based course.[9].Bioinformatics is a multi-disciplinary subject, with research questions taken from biology, medicine, pharmacology and agricultural studies. The name Bioinformatics suggests that it is multidisciplinary.[10].

1.8 Attitude towards certain preferred subjects: Now let us look at why a student prefers a particular subject compared to another one. The particular interest is to examine student attitude to the learning environment provided in the units that make up their discipline content. Moreover, some characteristics of learning environment support students in developing their subject skills such as the classroom setting, the availability of resource materials and the duration of subject lesson. In order to establish the learning environment, teachers have to play their role in influencing the social development of students particularly their attitude towards mathematics. During the process of learning, the teachers act to guide the students to focus and help them in the discussion.[11].

1.9 Attitude Engineering: Attitude is not seen as a unitary psychological construct, but as a category of behaviour that is produced by different evaluative processes. Students may express liking or disliking of mathematics because of emotions, expectations or values.[12].Attitude refers to someone's basic liking or disliking of a recognizable object.[13] .Since the objective of this model is of the interactions in a system, the experimental techniques that most suit systems biology approach are those that are system-wide and attempt to be as complete as possible.[14].During the process of learning, the teachers act to guide the students to focus and help them in the discussion. The importance of the research on attitude is related to the prediction of one's response to an object.[15]. Understanding students' attitude towards mathematics will help teachers to support their interest in that subject.[16].Having the right attitude is one of the basics that success requires. The combination of a sound personal philosophy and a positive attitude about ourselves and the world around us gives us an inner strength and a firm resolve that influences all the other areas of our existence.[17].

Most of the attitude models relate to psychology and hence cannot be applied to studying student's attitude. They are not applicable for Attitude Engineering. Studies based on students attitude towards various subjects, based on a study by Wolf and Fraser (2007)[18], they also examined the relationship between learning environment and students outcomes (attitude and achievement) using simple correlation and multiple regression with 165 samples. Majeed et al.(2002)[19] has conducted a study on students' perception on mathematics classroom learning environment with students' satisfaction was statistically significant at students' level.

MacLeod (1992)[20] pointed an issue that students' attitude is triggered by the situation rather than the emotion. Students' attitude is not easily changed over a period of time and it can be affected when they face mathematics problem (Hannula 2002) [21] .The importance of the research on attitude is related to the prediction of one's response to an object (Ajzen and Fishbein, 1977).[22]

A small but significant relationship was found between students' perceptions of their advisors' attitudes and their own academic performance. Also, qualitative data indicated that students perceived a positive influence on their success from talking to their advisors.[23].The purpose of the study was to determine the relationship among the learning environment, the teacher's factor and engineering technology students' attitude towards mathematics.
Specifically, the purpose of the study was to achieve the following objectives: a) to determine the difference in the learning environment, teacher's ability and student's attitude towards mathematics based on institute. b) to determine the relationship of learning environment and students' attitude towards mathematics. c) to determine the relationship of teacher's factor and student's attitude towards mathematics.

The above mentioned studies are proof that there exists a linkage between attitude and the placement choices of the students as reported in the literature on Student's attitude management issues pertaining to an interdisciplinary program. We have made an attempt to study the same.

2.0 MATERIAL AND METHODS

2.1 SRI RAMACHANDRA UNIVERSITY

In the year 1985,Sri Ramachandra University was established under the UGC Act as part of the Sri Ramachandra Education & Health Trust. Ever since its inception, this institute has grown from strength to strength gaining the status of a University in September, 1994 under Section 3 of the University Grants Commission Act, 1956. This study has been conducted with the help of the data collected in the Department of Bioinformatics for the M.Sc. (Bioinformatics) at Sri Ramachandra University, Chennai, Tamilnadu, India from the admission to their placement (the place where they are working).

2.2 STUDY CENTER

The department of Bioinformatics handles the scientific discipline integrating Biomedical Science and Information Technology to help understand biological processes were established in 2003. The objective of the department is to train the students in the ever expanding field of Bioinformatics by inculcating the concepts of various methods of Computing, Genomics, Proteomics, Structural Bioinformatics and Drug Discovery.

2.3 Name of the interdisciplinary program chosen: M.Sc. (Bioinformatics). The interdisciplinary program chosen for this study is the M.Sc. (Bioinformatics) course in the Department of Bioinformatics at Sri Ramachandra University, Chennai, Tamilnadu, India.

2.4 No of batches studied: 5 (2004 - 2008). The admission details (their undergraduate field of study) and the results of their placement had been studied for the students of the M.Sc. (Bioinformatics) course for 5 consecutive batches have been studied in the Department of Bioinformatics at Sri Ramachandra University, Chennai, Tamilnadu, India for the time period between 2004-2008.

2.5 Curriculum Model Selected: In the SRU model for the curriculum development, we have used the System Biology Approach for the M.Sc. bioinformatics course in the Department of Bioinformatics in Sri Ramachandra University, Chennai, Tamilnadu, India.

Since the purpose of this model is of the interactions of various components in a system, the experimental techniques that most suit systems biology approach are those that are system-wide.

The following are the advantages of using the SRU Model. a) System biology approach has been followed in this Curriculum Model. b) Flow approach has been followed. c) Three-tier architecture has been implemented in the curriculum model. d) This curriculum model is easy to follow. e) In the curriculum we move from the basic subjects to the advanced ones. f) There is layering of subjects in the curriculum model. g) Lab design is easy to implement. h) New developments can be very easily incorporated in this curriculum model. i) This curriculum model is highly flexible. j) We have followed the template approach to develop the curriculum model. k) This curriculum model can be upgraded very easily. l) Portability of this curriculum model for any other course is also possible. m) This curriculum model lends itself to ensuring quality standards.[24].

None of the Designs/Models have studied the student's attitude issues and its relevance to student's placement in various domains. Hence we have made an attempt to study this in detail.

2.6 Results: All the results are tabulated and analysed for three input groups such as Biology, Computing and Others. This is referred to in the Appendices 1, 2, 3.

3.0 DISCUSSION

Our analysis shows that the Study center, where SRU Model has been implemented and is stable with reference to producing an interdisciplinary science/ unidisciplinary for 5 years as it is found to be very flexible. In our study we have studied the results of 5 batches of Post graduate students in bioinformatics. Their fields of interest have changed from their area of expertise to a different field and they have got placed in these fields.

For e.g. a student with I.T background is able to acquire skills in Biomedical Sciences and gets labeled as a Biomedical expert and not as an I.T person. Similarly in many cases, the teacher's influence has resulted in a biology student specializing in Data Mining and Business Intelligence and Artificial Intelligence as the teacher has made the student an expert in the field. Certain mediocre students (input status) who were below average in relation to their peers have been able to find successful jobs in ITES sector. In some other cases, a student who has a narrow specialisation (Statistics and Mathematics- input) (Output- Artificial intelligence) has managed to get a job in Artificial Intelligence domain and he is the highest earner. In another case, a student who has a narrow specialisation (input) has managed to get a job in Business intelligence domain and the student is the highest earner. In another case a pure Biologist remains a biologist. In other case a pure Biologist remains a biologist, a pure Chemistry student remains a Chemist, and a Biochemistry students remains a specialist in that field. Whereas a student who acquires more than his/her basic subject becomes a real bioinformatician (a true interdisciplinary expert) and there is evidence that some students have become bioinformaticians in the real sense of the word. Hence the SRU Model has been the value proposition for the students of the Study center of the Sri Ramachandra University.

Our attempt has been to study the placement data of 5 batches of students (2004-2008) of M.Sc. (Bioinformatics) at the Department of Bioinformatics , Sri Ramachandra University, Porur, Chennai, Tamilnadu, India and to establish that attitudes of students towards certain

subjects plays a major role in shaping their careers. At this juncture, an academic program is being introduced of a true interdisciplinary nature such as Bioinformatics. The true advantages of Interdisciplinary sciences are as follows.

- When a student wants to narrow his field of specialisation, studying a science which is truly inter-disciplinary is useful.
- 2. More and more new areas for research and development are identified like Bioinformatics, Biomedical Engineering, Nano Metallurgy and so on.
- 3. The true advantage of an interdisciplinary science is that the student can specialise in their own area (subject studied in graduation level) or the new multidisciplinary science (subject studied in the post- graduation level).

3.1 About our Study Center: This study has been conducted with the help of the data collected in the Department of Bioinformatics for the M.Sc. (Bioinformatics) at Sri Ramachandra University, Chennai, Tamilnadu, India from the admission to their placement (the place where they are working). The following are the results of the study conducted based on the data of the students of M.Sc. Bioinformatics at the Department of Bioinformatics, Sri Ramachandra University, Chennai, Tamilnadu, India during the period of 2004-2008 for 5 consecutive batches.

Research shows that the Study centre where SRU Model has been implemented is stable with reference to producing an interdisciplinary science for a 5 year period as it is found to be very flexible.

Hence the SRU Model has been the value proposition for the students of the Study centre of the Sri Ramachandra University, due to its System Biology Approach and it is proof that this Model has helped the students to be flexible in developing their area of specialisation or sticking to their specialisation subjects in their graduation.

There are certain cases where the students have specialised in new emerging areas. Therefore all students have benefitted from the SRU Model. Our attempt has been to study the placement data of 5 batches of students (2004-2008) of M.Sc. (Bioinformatics) at the Department of Bioinformatics, Sri Ramachandra University, Porur, Chennai, Tamilnadu, India and to establish that Attitudes of students towards certain subjects plays a major role in shaping their careers after placement in various domains.

At this juncture we were able to study the individual components (Attitude related issues like Subjects, teacher's influence, Peer influence, Opportunity Trend influence, Attitude, Students influence).Research shows that the Study centre where SRU Model has been implemented for the last 5 consecutive batches is stable with reference to producing an interdisciplinary science specialist for a period of 5 years as it is found to be very flexible. These could be the result of Peers influence, Influence of parents and the influence of teachers.

Here outcomes or ends are identified as the good and the means are selected to meet that good. The end justifies the means. This is associated with Utilitarianism and John Stuart Mill (1806-73). It is listed below as End Right. Some call it the ethics of consequences.[25].

The choice of the career of students which is an exhibition of their attitude towards placement could be a result of the consequential reasoning. At this juncture we were able to identify the individual components (Attitude related issues like Subjects, teacher's influence, Peer influence, Opportunity Trend influence, Attitude, Students influence). Thus this could

be the result of student's attitude engineering which consists of the individual components mentioned above and their interaction with respect to the result (placement).Hence we can conclude that the components of attitude engineering and its interaction with regards to placement could be a result of consequential reasoning.

4.0 SCOPE FOR FURTHER STUDY

Further study needs to be done to evolve an appropriate models/tools to quantify the above mentioned attitude related issues for standardisation and value addition.

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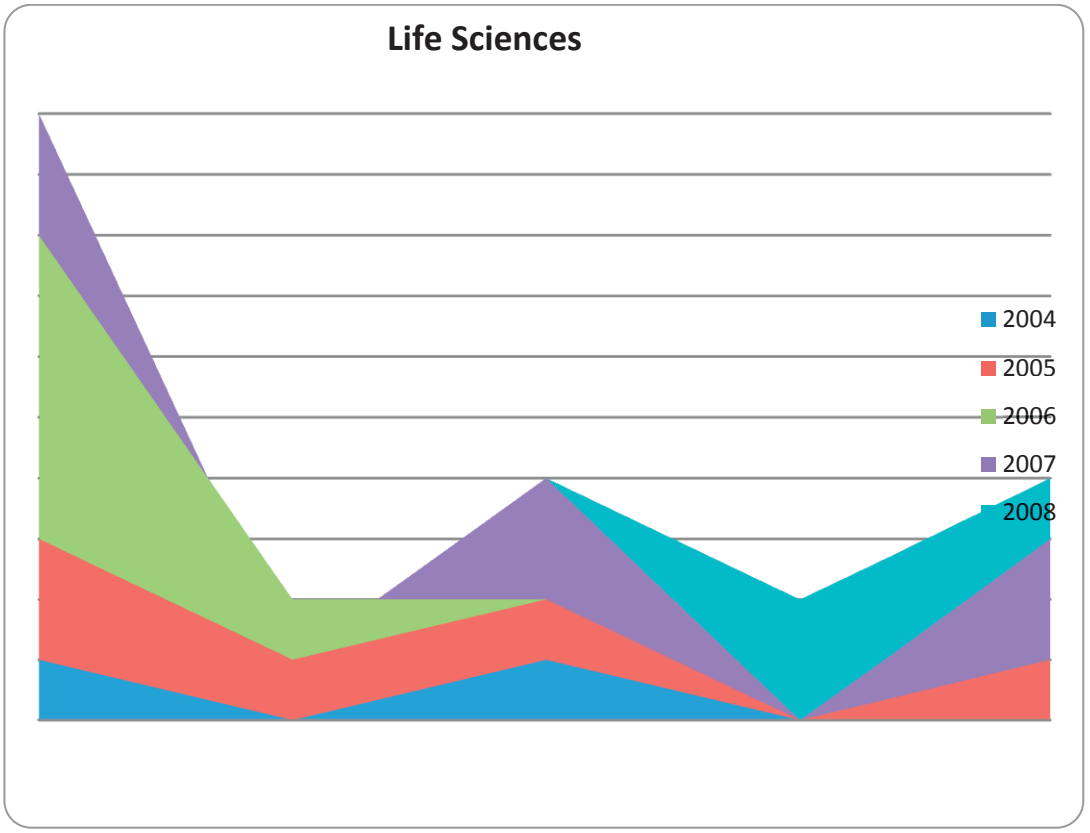
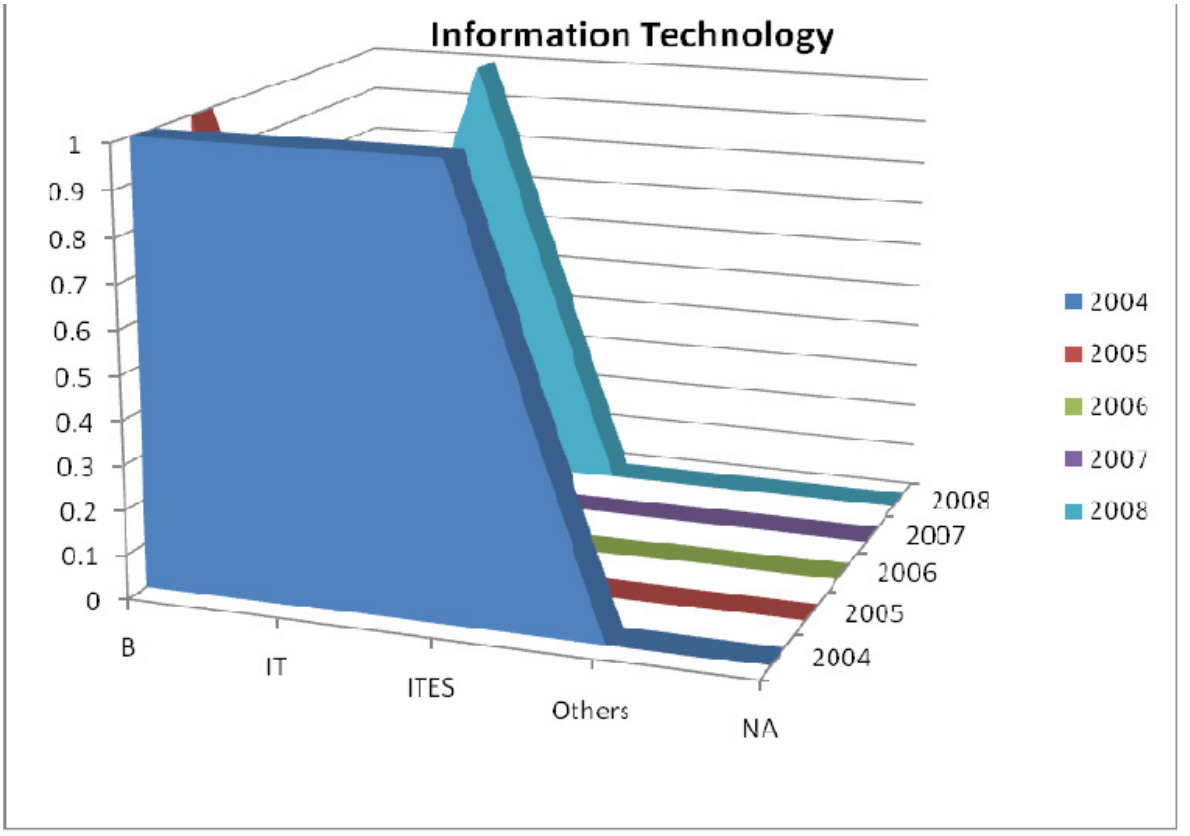
APPENDIX 1(Pic 1)
Student Placement details for Life sciences group (Input)



APPENDIX 2(Pic 2)
Student Placement details for Information Technology group (Input)



APPENDIX 3(Pic 3)

Student Placement details for Others group (Input)