

Object Oriented Programming Using Real Life paradigm with open source Technology

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Abstract: Over the years Object oriented programming (OOP) has gained the dominance in both the software industry and education. Advance pedagogy is the way to enhance teaching and learning performance. Different innovative teaching methods are now in use across the globe. There are a number of OOP versions released by Software companies and the same are adopted by the educational institutions at various levels in their curricula. The main reason for this inclination is driven by the fact that OOP solves any problem by imitating the mental model of humans. It is usually a challenge for teachers to imbibe OOP concepts in novice programmers. Teaching fundamentals of OOP at an introductory level is challenging. This paper presents a pedagogical approach used for teaching/learning process of Object Oriented Programming in C++ course offered at MCA. The course focuses on development of OOP skills and concepts among students. The approach uses real life analogies to effectively enhance the learning of OOP concepts among students. Students might program in an OOP language but fail to program in an object-oriented style. This is because students are unsuccessful to model given problem in terms of objects. To ease this, single real life example around class as a core is used to help students acquire these OOP concepts. It mainly helped to join with ease the new concepts and mechanisms, such as class combination, inheritance and polymorphism. Eventually the example expanded into a kind of system. The proposed methodology comprised of five stages in which students are introduced to classes and objects, constructors and destructors, abstraction and encapsulation, inheritance and polymorphism concepts. This approach demonstrated effectiveness in motivating students to incorporate OOP concepts for developing simple real world applications. It has also improved the quality of teaching object oriented programming course. An evaluation of the problems experienced in teaching OOP is presented and some possible approaches for improving the quality and success of such courses are discussed.

Keywords: Object Oriented Programming, Object-oriented technologies, Real life Analogies, Class.

I. INTRODUCTION

Over the last ten years Object Oriented Programming (OOP) has become the leading programming style in both education and software industry. The purpose of this work

is to incorporate new methodology in teaching learning methods to create a rich learning experience for students and a rewarding teaching experience for faculty. The purpose of education is not just making a student literate, but adds rationale thinking, knowledgeable and self sufficiency. That's why teaching nowadays must include innovative communication methods that impart knowledge. Some innovative methods of teaching could be Multimedia, the combination of various digital media types such as text, images, audio and video, into an integrated multi-sensory interactive application or presentation to convey information to the students.

We have number of OOP languages which are released by software companies and most of the educational institutions have included these in their curricula. Most university courses on programming have moved from C to object oriented languages like C++, Java, Python and C#. The main reasons for this tendency are related to having advantages like: abstraction, encapsulation, inheritance and polymorphism. Object oriented methods scale up very well with the increasing sizes of real life software projects and enable design of complex software products. However, because of the paradigm shift in OOP languages, switching from the older crucial procedural programming style to object oriented style remains to be a challenging task. Students who have been exposed to procedural programming find it a little difficult to move towards OOP. It takes the average programmer 6 to 18 months to switch her mind-set from a procedural to an object-oriented view of the world [1].

The pedagogy of traditional imperative programming languages is built upon sequence; selection and iteration. They are mostly based on the von Neumann architecture. Hence, teaching traditional popular languages such as C is directed by the design and implementation of common algorithms and data structures. This pedagogy requires teaching the syntax and basic structures of the language as early as possible. The early stages of teaching are dominated by the peculiarities and syntactical details of the language. On the other hand, the main focus of OOP teaching is problem solving, rather than language details. Since C++ is a descendent of C, it has a negative legacy effect of traditional programming which is the emphasis on syntactic and structural details of the language. As a result,

our students are inclined towards coding C++ programs in a non-object-oriented style.

Often there are presumptions that OOP training in the earlier stages of programming education is too hard and complex [2][3]. To some extent these prove to be true. Nevertheless, these difficulties can be overcome by choosing effective teaching pedagogies and careful design of the courses [2]. Object oriented software technologies are fundamentally based on the modeling of real life objects. It is therefore expected to place the explanation and identification of objects at the start of an OOP course. Generally speaking, object-orientation is not only a programming style but also a methodology that deduces from general concepts to the special and induces from the special to the general. The course aims at training students to program in OOP language. The objectives of the course are listed below:

1. Articulate the principles and benefits of object-oriented approach in problem solving.
2. Write Object Oriented programs using basic programming constructs and data structures.
3. Apply the concepts of class, method, constructor, instance, data abstraction, function abstraction to implement the encapsulation features in Object Oriented programming languages.
4. Write modular, secure and reusable code to exemplify the features of inheritance, polymorphism and generic programming.
5. Perform file-related activities using OOP paradigm.

The objective of this paper is to identify the new teaching methodology as a transformational approach which could positively impact the issues of learning quality and mobility of education. The philosophical worldview of the researchers, their subsequent research methodologies and rationale as well their thesis, anti-thesis and findings are being discussed through this study.

II. TEACHING PEDAGOGY

Class is the foundation of object programming. Hence, the process began with dealing of real life examples and class as the core in order to trigger the object oriented programming thinking among students. It is the fundamental mechanism that tries to achieve the organizational form of data encapsulation and information hiding. Therefore, the course delivery began by using class as a core and further adding features. The sooner the understanding and grasp of the conception of class, the students will learn effectively.

Teaching with technology engages students with different kinds of stimuli involve in activity based learning. Technology makes material more interesting. It makes students and teachers more media literate.

There are many multimedia technologies that are available for developers to create these innovative and interactive applications. The teacher uses multimedia & open source

tools to modify the contents of the material. It helps students to represent in a more meaningful way, using different media elements. These media elements can be converted into digital form, modified and customized for the final presentation. By incorporating digital media elements into the project, the students are able to learn better since they use multiple sensory modalities, which would make them more motivated to pay more attention to the information presented and retain the information better.

The groups of students are formed and they need to bring 3 real life issues of problem statement. The committee of faculty members will screen and finalize a problem statement. The students must develop the solution for the selected problem statement using object oriented programming paradigms. The first phase was students group and problem statement was finalized. The second phase course instructor will demonstrate specified open source tool. The students need to work on the tool and develop the UML diagram depending on the problem statement. The third phase students used the open source UML designing software tools like E draw , ArgoUML, Astah, Dia, Eclipse, Modelio etc to represent the UML diagram for a given problem statement.

Software design is a cognitively challenging task. Designers must manually enter designs, but the primary difficulty is decision making rather than data-entry. If designers improved their decision-making capabilities, it would result in better designs. Current CASE tools provide automation and graphical user interfaces that reduce the manual work of entering a design and transforming a design into code. They aid designers in decision-making mainly by providing visualization of design diagrams and simple syntactic checks. Also many CASE tools provide substantial benefits in the area of version control and concurrent design mechanisms. One area of design support that has been not been well supported is analysis of design decisions. Current CASE tools are usable in that they provide a GUI that allows designers to access all the features provided by the tool. And they support the design process in that they allow the designer to enter diagrams in the style of popular design methodologies. But they typically do not provide process support to guide the designer through the design task. Instead, designers typically start with a blank page and must remember to cover every aspect of the design. ArgoUML is a domain-oriented design environment that provides cognitive support of object-oriented design. ArgoUML provides some of the same automation features of a commercial CASE tool, but it focuses on features that support the cognitive needs of designers.

Over the past decade, Object Oriented Analysis and Design has become the dominant software development paradigm. With it has come a major shift in the thought processes of all involved in the software development life cycle. An OO system is designed and implemented as a simulation of the real world using software artifacts. This premise is as powerful as it is simple. By using an OO approach to design a system can be designed and tested without having

MOVIE_COPY	MEDIA_FORMAT	Recording format of the movie copy (DVD or VHS)
MOVIE_COPY	MOVIE_ID	Part of primary key—foreign key to MOVIE table
MOVIE_GENRE	MOVIE_GENRE_CODE	Primary key—a code used to place movies into categories such as Comedy, Drama, Action-Adventure, and so forth
MOVIE_GENRE	MOVIE_GENRE_DESCRIPTION	Text description of a movie category (see MOVIE_GENRE_CODE)
MOVIE_LANGUAGE	LANGUAGE_CODE	Part of primary key—foreign key to LANGUAGE table
MOVIE_LANGUAGE	MOVIE_ID	Part of primary key—foreign key to MOVIE table
MOVIE_RENTAL	COPY_NUMBER	Part of primary key—foreign key to MOVIE_COPY table
MOVIE_RENTAL	DUE_DATE	The date a rented movie is due to be returned to the store
MOVIE_RENTAL	LATE_OR_LOSS_FEE	Fee charged (if any) because the movie copy was returned late or was permanently lost

Fig (3)– Video store Database table Columns

The scope of this example is to identify the processes that comprise the architecture and provide narratives for their functional content. The functional narratives are designed to provide all-inclusive specifications for an entire function rather than trying to derive a function from a set of individual requirements. In addition inter-process messaging and derived dependencies shall be identified. This level of specification is intended to provide enough information to properly review process system level functional content and inter-process messaging and dependencies in preparation for the subsequent effort to derive detail process requirements and design. Since this software will by default become the system functional specification, it is important to ensure that this level is as clearly defined as possible.

The Video Store Database Management Software System shall be designed and developed to provide a clear and easy to use Database Management System for any customer. The Database Management Software System shall facilitate and optimize employee management, customer interaction and a virtual video warehouse.

The phase 4 was implementation of the given problem statement where the students used the Net Beans , Google Web Designer , Dreamviewer etc to build the project. The course instructor demonstrated the tools to students and then tried using the tools to construct project.

The students will be able to develop a project that will be client server application used by multiple users at several locations. Users will be able to interface with the system via Web Page while connected to the Internet. The system will provide communication to a centralized database system. The fifth phase students will give presentation about the project developed by them for a given problem statement. The evaluation committee will appraise the performance of the students.

In teaching this course using real time analogies it was most evident that extra assignments of similar kind were very effective. Plenty of practice assignments were given to students in groups to solve. After completing each concept students were asked to add that concept in to the existing code to eventually to form a complete program. The

practice assignments probed the students to relate their real life experiences with the OOP concepts.

Phases	Milestones for Evaluation	Max. Marks (%)
Phase I	Problem Definition ❖ Problem Statement	20
Phase II	Usage of open source tools ❖ Tools & Technology used ❖ Innovative elements	10
Phase III	System Design using open source tools ❖ Architectural Design ❖ UML Design	30
Phase IV	Implementation ❖ Working Modules with proper validations	30
Phase V	❖ Final Presentation and queries	10

Fig (4) – Rubrics of evaluation

III. EVALUATION OF RESULTS

The purpose of education is not just making a student literate, but adds rationale thinking, knowledgeable and self sufficiency. Education is an engine for the growth and progress of any society. It not only imparts knowledge, skills and inculcates values, but is also responsible for building human capital which breeds, drives and sets technological innovation and economic growth. Nowadays information and knowledge stand out as very important and critical input for growth and survival. Rather than looking at education simply as a means of achieving social upliftment, the society must view education also as an engine of advancement in an information era propelled by its wheels of knowledge and research leading to development.

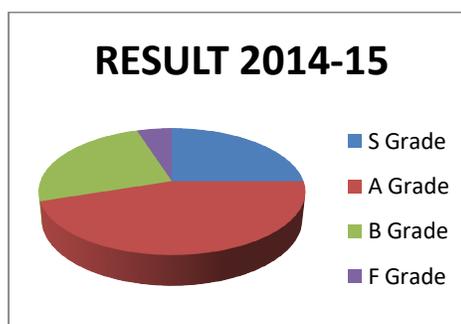


Fig (5)– Video store Database table Columns

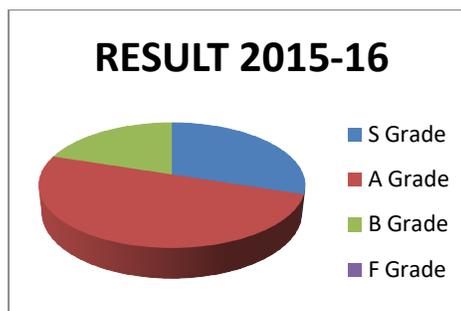
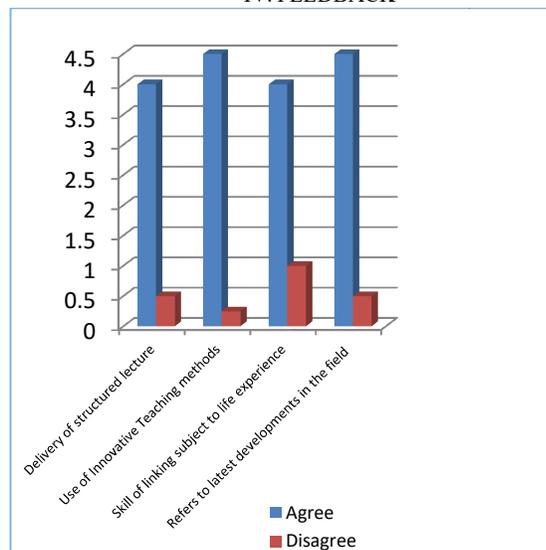


Fig (6) – Result Analysis 2015-16

During the process students were evaluated for a number of practice assignments. These assignments which were given in groups about the similar examples to solve

were evaluated and allotted marks. The results showed that students fared well in most of the assignments. Some of the students were unable to manage with assignments on Abstraction, Encapsulation and Polymorphism. For such students repeat exercises were given and trained. At the end of the course, a feedback about the approach adopted was given by the students. The main aims of the pedagogy are: (1) to build an Ideal Classroom for the 21st century (2) to integrate multimedia learning environment into teacher-education, (3) to test the efficiency of the newest ICT tools in education (4) to develop curriculum materials for different ages to foster deep understanding and to motivate students through bringing real-life problems and new directions of teaching methods to school. Flexible furniture and technology is also a perfect environment for students to obtain the skills they will need in the real-life knowledge-based digital world.

IV. FEEDBACK



Fig(7) – Result Analysis 2015-16

V. CONCLUSION

Across the world, information technology is dramatically altering the way students and faculty learning. Internet-ready phones, handheld computers and digital cameras are revolutionizing the college life. The purpose of this paper is to suggest useful innovative assessment methods that can be attempted in imparting knowledge to the students, any assessment method without destroying the objective could be considered as innovative methods of teaching. Our methodology helped the students to improve their interactive illustrations, understanding in depth of concepts, emphasis on key elements and communication skills. The student's presentation skills were improved.

In teaching the course “Object Oriented Programming using real life paradigm with open source technology” to MCA students, analogies were used to relate object oriented concepts to familiar real life scenarios. Joining with ease most of these concepts and mechanisms in the

same example facilitated deepening of teaching/learning process. Using class as core helped students to complete the assignments in OOP style. The significance of this approach is driven by its applicability and usefulness in teaching OOP concepts for beginners. The approach has been tested with students were it agreed to be easy to acquire and consequently apply OOP concepts in problem solving. It also aids students in visualizing the OOP concepts provided by the real life scenarios. Through this approach it was found that, students learnt to correlate their real life experiences with OOP concepts which are a pressing requirement in problem solving. The course outcomes where successfully achieved and Program Outcome 1, 2 and 3 where attained. As to conclude our teaching pedagogy provides effective tools for students and prepares them to enter and successfully compete in the ever-expanding high-tech global marketplace.

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