

Approaches to the Design of Education Technology Based on Patterns

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Abstract- Because educational technologies built on pedagogical foundations make learning and teaching easier, instructional design is an important component of educational technology. On the other hand, today's most popular instructional technologies have two key challenges: When it comes to instruction design, there is no strong grounding in the subject matter, and there is no motivation to employ a wide range of instructional methods and techniques. These issues can be addressed by creating teaching tools based on pattern analysis. Present studies focus on either instructional or software patterns. This new research is a break from the current research paradigm. We use patterns to express instructional design knowledge and relate it to patterns in software architecture. The core of our strategy is this. In instructional design, there are various sorts of patterns, which we'll cover in this section.

Keywords- Pattern, approaches, design, education technology, Scale and Variety

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1. INTRODUCTION

Training in culture is really important. It is the foundation on which community can be continued, people can be taught, civilization can develop and for other purposes.

Training is split into stages and modalities in certain places. In the United States, pre-school, major, secondary and university stages are only few cases. Notice that there are also differences in the country's own school framework.¹

On the other side, modalities may be:

- Curriculum for young people and adults
- Curriculum for young people and adults
- College at distance
- Among others.

Over the time several improvements have not been made to the school method, which involves the conventional form of schooling with which we are acquainted (basic and college).

However, in education, digital innovation has created major improvements. In this article, you can read the

impacts and advantages for teachers and students of these reforms.

Education is an instructional and learning method intended to socialize and optimise the growth of individuals.

Although these two words can be generally correlated with information, they should not be mistaken. Education is associated with moral norms, and more than that awareness.

It does not reflect them in itself, while it is connected to moral law. Thus, schooling with numerous approaches, techniques and instruments is known as a systematic scheme.

Learning in education is a key element of this set, see below!

1.1 Teaching methods

In school there are various instructional approaches.

1. **School education:** is a standard education for our community in which all citizens must invest in their youth and adolescent years. It is split into the basic and university tiers.
2. **Special education:** Special education for disadvantaged individuals or for medical

diseases.

3. **Training and Technology:** Workforce-based training focused. It encourages students to acquire professional expertise and skills in a specific area to support them in the work sector.
4. **Young and adult education:** aimed to people who at their own age have not finished their formal education. The school systems can provide this modality free of charge.
5. **Distance education:** A modality that has been common with and has been growing since the advent of the digital era. As the name states, this type of teaching is typically online via DE channels through the Internet.

1.2 Education in the digital age

Technological advances, growing digital age and the Internet, including schooling, have influenced many fields.

In this region, the technology is progressively being used in classrooms and classical teaching models are being fully interrupted.

Institutions are leveraging the ease and advantages of features like the website, mobile gadgets, gaming and video media progressively to transform education.

We have hybrid instruction in situations where these two styles are used.

Hybrid curriculum holds technical advancements up to date, draws students' interest and lowers expenses and maintains on-the-ground educational properties.

Many organizations are, on the other hand, starting to incorporate online training in full and offering total online training, especially in higher education.

Furthermore, informal courses are another field that develops within distance education. Since they provide instruction beyond the classroom, these classes are not part of the educational concept, but are an important resource for those who choose to instruct and learn.

They often contribute to community in a significant and increasing way. You can read more about the following prospects.²

1.3 Benefits of education

The advantages of education are various and the following are significant -

1. Poverty reduction

Most children in severe poverty have little access to basic schooling, and the root cause of poverty is viewed as a shortage of education. For eg, if all children leave school with simple reading skills, 171 million people would be raised from poverty. This is a 12% fall at the global level. Furthermore, changes in schooling highlighted by the Committee on Education could help reduce absolute poverty by 30%.

2. Improved sales

The prospect of receiving better wages is one of the advantages of college. A individual with a degree is more likely to get a more lucrative career. For eg, with any additional year of college, earnings rise by about 10 percent. Higher education encourages individuals to specialize in many areas, opening up various possibilities for earning.

3. Improved sales

Education is one of the most significant having equal citizens. Equal access to education is important in order to guarantee that everyone has equal opportunity regardless of ethnicity, ethnicity or social status. Almost two-thirds of the 775 million analphabets worldwide, for example, are female. Sometimes, this shortage of schooling drives them away from decent employment. Access to schooling further increases prospects for women and children. In reality, for each additional school year, a woman's income will rise by 10-20 percent.

4. Principles for wellbeing

Education mothers' offspring are more able to live their lives in a safe way. They are, for example, more likely to be vaccinated and their development is less vulnerable to malnutrition. In contrast to mothers that do not have much schooling, infants born to moms who are secondary or higher education are twice as likely to live past the age of five.³

5. Sustainable development

Countries with large levels of literacy have high wages per capita people. In comparison, developed nations, which are mostly below the poverty line, typically have elevated rates of analphabetism. In 2050, for example, GDP per capita is almost 70% smaller in low-income countries than all children can learn.

6. Fosters criminality

Training forms a perception of right and wrong and typically instils a sense of responsibility towards community. Among the most disadvantaged are individuals living in poverty. Therefore, they often go to criminal activity because of the shortage of

opportunities. Education often makes us prevent these risky behaviors, since education increases resources.

1.4 Issues/challenges in education

The significant issues and difficulties of instruction area and the concerned issues has been managed under the accompanying sub-heads- 4

1. Use on schooling
2. Net enrolment design
3. Limit use
4. Framework offices
5. PPP model
6. Understudy instructor proportion
7. Accreditation and marking – quality guidelines
8. Understudies concentrating abroad A short portrayal of the above has been set down in the approaching sections.

2. A PATTERNS BASED APPROACH FOR DESIGN OF EDUCATIONAL TECHNOLOGIES

Instructional architecture is a central cornerstone of curriculum technology, since it offers the framework for the promotion of pedagogical learning and education. However, several of the educational advances of today raise two main problems in this sense: (i) I may not have a basic education design; (ii) a shortage of support across a large range of education ideas. In order to overcome these issues, we recommend a trend focused approach to the advancement of educational technologies. This focuses on either patterns or applications, but not both, as contrasted with recent studies. The key theory of our method is to use patterns to model education knowledge and to compare it to software design patterns. We discuss different styles of developments in instructional architecture. The notion of a POID is then introduced as a means for modelling instructional design in the form of a partnership of symbols (Goal pattern, Process Pattern and Material Pattern), integrating it with POSA, a software design focusing on simple concepts. Through case study in adult literacy, we explain our approach (287 million learners, 22 Indian Languages and a variety of instructional designs). The results of the method, which are multiple free and tablet variants, were adopted by the National Literacy Mission Agency of the Government of India.⁵

• Patterns as a Solution

The One fascinating approach that has been undermined and often unexploited in augmented

technology learning is the usage of patterns & patterns in developing teaching designs. The embedding, simulation and distribution of professional information and best practices to novices in a field is the basic principle of patterns and pattern languages. Basically, trends are extracted from interactions which, in a particular sense, include symbolic examples of repeated responses to re-curing issues. It is believed that the origins of patterns are in the eld of architecture and are commonly practiced mostly to measure performance of product architecture and to facilitate reuse. software engineering.

For various areas of teaching and learning, there is often comprehensive work on templates and pattern languages. The Pedagogy Trends Project was a big opportunity to capture best teaching and learning activities as a means of recording best instructor guidance and promoting the standard of instruction. Another programme is the E-LEN project, which seeks to include pedagogically informed technologies and interactions as pattern languages for emerging organizations, with a special emphasis on learning management systems. There is a pattern vocabulary with both innovative and functional learning addressed. Using a design science method, Lorillard has developed pedagogical trends. Patterns and pattern libraries have been suggested for individual-centered e-learning. Another way was to chart the trends produced from seminars for practitioners.⁶

• Guiding Principles

The suggested solution is based on the following fundamental concepts that promote the creation of instructional technology for scale and variety.

During the creation of instructional technology, it is important to enhance edibility and reusability while reducing sophistication, and some of these issues are answered by the information engineering group by a series of basic principles. The idea of division of concerns, which assists in the management of various aspects of a structure while improving reusability and reducing ambiguity, is one theory that this paper is interested in. This theory can be used either horizontally or vertically to distinguish problems in the form of layers; views; modules; aspects; trends, characteristics, and so on. Modularity is a specialization of this concept that deals with the splitting of functionality into modules, although abstraction is another expertise that masks c of the method complexities such that programmers can concentrate on particular problems. Another underlying theory is domain-driven architecture, which seeks to reduce ambiguity by emphasizing the domain as the framework for software creation. In order to systematically model instructional architecture in the context of trends, we extend these concepts throughout the article. These

concepts are explored in greater depth. In the next segment, we'll go through some important points regarding trends before digging In terms of the meat of our design strategy.⁷

• **Origins of trends, growth and layout**

Source and progress in patterns - The specialist encounters several ongoing issues and different approaches to overcome their difficulties throughout an elderly expert's career. When a community of professionals collaborate, debate, discuss and record their knowledge in a particular context, they understand that some strategies operate and do not work in specific situations.⁸

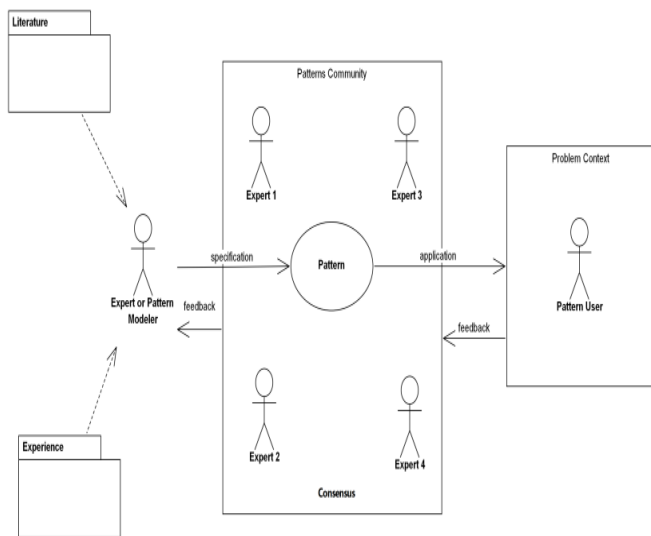


Figure 1: Overview of patterns life cycle

This points to the belief that the principal sources of patterns are literature or information, actual or documented interactions of best practice and advice. The granularity of a design is another significant aspect that needs to be taken into account during pattern development. For e.g., coding (a pattern), architectural patterns and architectural patterns, which all have an enhanced amount of abstractness, are coding idioms in software engineering. Pattern languages facilitate the relationship of these patterns by illustrating how they communicate and can be used to solve unique problems. A majority between an expert group is normally required to determine whether or not a certain piece of knowledge is fashionable. Since 1994, the society of Hillside has sponsored a series of conferences along with workshops recognized as Pattern Languages of programmes (PLoP). These venues may be used by pattern writers to meet, study, understand and document trends. The outcome of this series is the development of model groups such as AsianPLoP, EuroPLoP and Scrum PLoP to recognize patterns that local populations follow. A template is typically found, defined, applied and controlled and continuously overhauled based on up-to-date pattern knowledge. Figure 1 indicates a typical step during

design. The trends have often come primarily from seminars in the area of education.

In essence, patterns are identified by an expert or pattern modeler, and they originate from literature or practice. Once the pattern is specified, a consensus of the pattern is sent to the group for approval by elderly experts for review. This pattern is introduced in different issue situations by pattern consumers and generates suggestions contributing to pattern changes.

Alexandrian Form	Gang of Four Form	Pedagogical Patterns
<ul style="list-style-type: none"> • A picture • **** denoting start • A headline in bold type (essence of the problem) • The body - background, motivation, variations • The solution, in bold type • A diagram for the solution • *** as termination • A paragraph that ties the pattern to all the smaller related patterns 	<ul style="list-style-type: none"> • Name • Classification • Also Known As (optional) • Motivation • Applicability • Structure • Participants • Collaborations • Consequences • Implementation • Known Uses • Related Patterns 	<ul style="list-style-type: none"> • Name • Thumbnail • Audience/context • Forces • Solution • Discussion/ consequences/ implementation • Special resources • Related patterns • Example instances • Contraindications • References

Figure 2: Difference in pattern form

Pattern Structure - Patterns can be seen anywhere and at numerous levels of granularity, and they are articulated in various forms by different specialists in various cultures. This raises the question of how to capture pattern information and what comprises it. Patterns are historically defined as a collection of circumstances, a problem, and a solution. Several scholars, on the other hand, have suggested numerous structures for collecting pattern information. Examples of widely encountered pattern constructs from the information engineering and pedagogy realms are shown in Figure 2. The most widely used format for depicting patterns is the Alexandrian type. Alexander has recorded a pattern language for the realm of cities, houses, and design using this type, which consists of 253 patterns. In the area of software design, the 23 Gang of Four (GoF) versions are the most often deployed models that utilize the meta data as seen in Figure 2. The project for Pedagogical Practices utilizes the system seen in Figure 2. There are only a few instances of pattern frameworks that have been utilized by numerous cultures. A pattern language for pattern representation has arisen from the culture itself.⁹

• **Patterns for Scale and Variety**

A complex pattern structure derived as seen from existing trends in Figure 3. The main concept of this pattern layout is to collect as much detail as possible so that patterns and pattern archives can be checked for and handled using these metadata. Patterns may be depicted physically, based on

layout as well as actions, in comparison to the textual details seen in Figure 3. One crucial criterion in this paper for patterns, though, is to make it easy for Domain experts without overloading model pattern knowledge. In his groundbreaking work on patterns, Alexander discusses that a pattern solution can be used a million times, without ever attempting way again.¹⁰

Knowledge Field	Brief Description
A Picture	Illustrates the overall nature of the pattern, problem and solution.
Name	Succinctly conveys the essence of a pattern.
Motivation	A statement conveying the rationale and motivation of the pattern.
Source of Pattern	Specifies the source(s) of this pattern along with rationale.
Confidence	Specifies the confidence of the domain expert for this pattern.
Level of Abstraction	This field specifies the level of abstraction i.e., where the pattern stands in the continuum of conceptual to concrete implementation.
Classification	Provides a classification of the pattern under a category. We have identified <i>Context, Goals, Process, Content, Evaluation, Environment</i> as few major categories of instructional design. But there can be other kinds of classifications and other categories as well.
Problem	The precise problem that this pattern intends to solve.
Solution	Precisely specifies the solution provided by this pattern.
Structure	A diagram showing the structure of the pattern, relationships between various aspects of the pattern, inputs and outputs.
Pre-Conditions	Specifies pre-conditions i.e., the prerequisites for using this pattern.
Post-Conditions	Specifies post-conditions i.e., the outputs expected out of this pattern.
Trade-offs	Trade-offs of using the pattern, focusing on the pros and cons.
Implementations	Describes how this pattern should be implemented along with activities for using this pattern.
Known Uses	Real life examples of this pattern along with links to sources.
Related Patterns	Discusses patterns that are closely related to this pattern outlining the differences with other patterns and any dependencies.
Alternatives/Adaptions	Suggests alternative patterns and most importantly specifies the variability points for adapting the pattern for different scenarios.
References	Points to reference material related to this pattern.

Figure 3: A detailed pattern structure

In order to promote size and diversity, we expand this definition to involve not only the answer, but also the problem, its variants, its pattern depictions, its numerous aspects and its variants.

There are many possibilities for producing pattern variants. The easiest case is that a sequence as seen on the left-hand side of Figure 4 may be instantiated several times or with simple variations as seen on the right Figure 4 illustrates a basic illustration of the numerous forms of potential interactions that may occur between two patterns in a domain. We get a new perception of the trend in context if we alter certain

relationships, which results in a difference. Similarly, as seen in Figure 4, patterns can be generated using a number of operators. Changing the operators results in new trends and changes in the composition. If we go beyond only two patterns and take into consideration a wide range of patterns, so various composition strategies contribute to several operators.¹¹

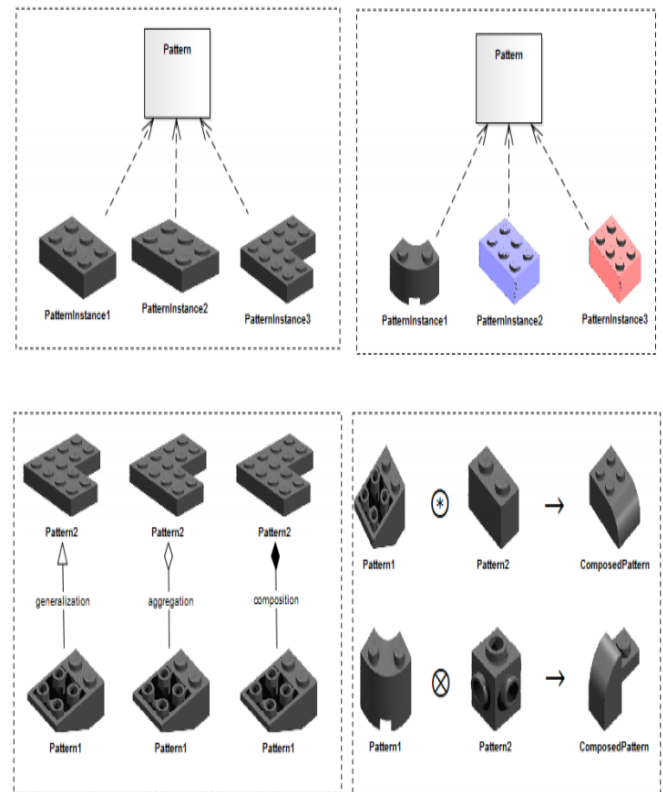


Figure 4: Any differences in patterns, ties and compositions

to a number of Methodologies for domain simulation with a 10-template instructional design in mind, then different compositions of these templates contribute to multiple variants of instructional design. This allows to create multiple suction prototypes that fulfil the specifications of special needs. It's just about stressing that the simulation of a domain is patterned. makes it simpler to construct several variants in a structured way, which is one of the paper's main aims. With illustrations in the article, we shall expand further on these trends. However, the formalization of pattern classification and composition is outside this paper's understanding and will be discussed in future study.¹²

3. CONCLUSION

It is vital for educational technology designers to have a solid foundation in instructional design. Facilitating reusability and supporting a wide range of instructional designs are also difficult challenges. A pattern-based strategy that incorporates patterns into instructional design and educational technology was offered to solve these challenges. Software

engineering fundamentals are the basis for this technique. Pattern-Oriented Instructional Design and Pattern-Oriented Software Architecture are the guiding concepts of our design architecture, which we used to create an educational technology. Patterns such as the Goals Pattern, the Process Pattern (plays, acts, scenes, instructions), and the Content Pattern are the core of our approach to instructional design (facts, cases, rules, models and theories). In a case study on adult literacy in India, we used our technique to model patterns to show how it may be used. After that, we presented an implementation of our strategy that provides writing tools for instructional design based on pattern recognition and analysis. Final thoughts: this report represents an important step forward in the study of software engineering solutions to educational technology concerns.

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