Teaching Data Structures through Group Based Collaborative Peer Interactions

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Sajid Nazir[1]

Stephen Naicken[2]

James H. Paterson[1]

[1]School of Computing, Engineering and Built Environment, Glasgow Caledonian University, Glasgow, UK

[2]African Leadership College, Pamplemousses, Mauritius

Introduction

➢ Important subject

➢ Difficulties faced by students

➢ Hands-on approaches can help

➢ Group based peer interactions

➢ Students develop solutions through peer support on whiteboards

Importance of Data Structures

"I will, in fact, claim that the difference between a bad programmer and a good one is whether he considers his code or his data structures more important. Bad programmers worry about the code. Good programmers worry about data structures and their relationships."

Linus Torvalds – creator of Linux

The Problem

- ➢ Programming is challenging
- ➢ Complexity of Data Structures
- ➢ Difficult yet important
- ➢ Students face difficulties
  - Abstractions
  - Hard to program
  - Connection to real-world
  - Stragglers
- ➢ Diverse backgrounds

Challenge and Opportunities

- How to make it interesting?
- Can peer support help?
- Use of flipped classroom
- Learning Environment
  - Blackboard as VLE
  - Teaching materials and assessment
  - Tutor delivered sessions

Related Literature

➢ Student involvement
➢ Games and real-life examples
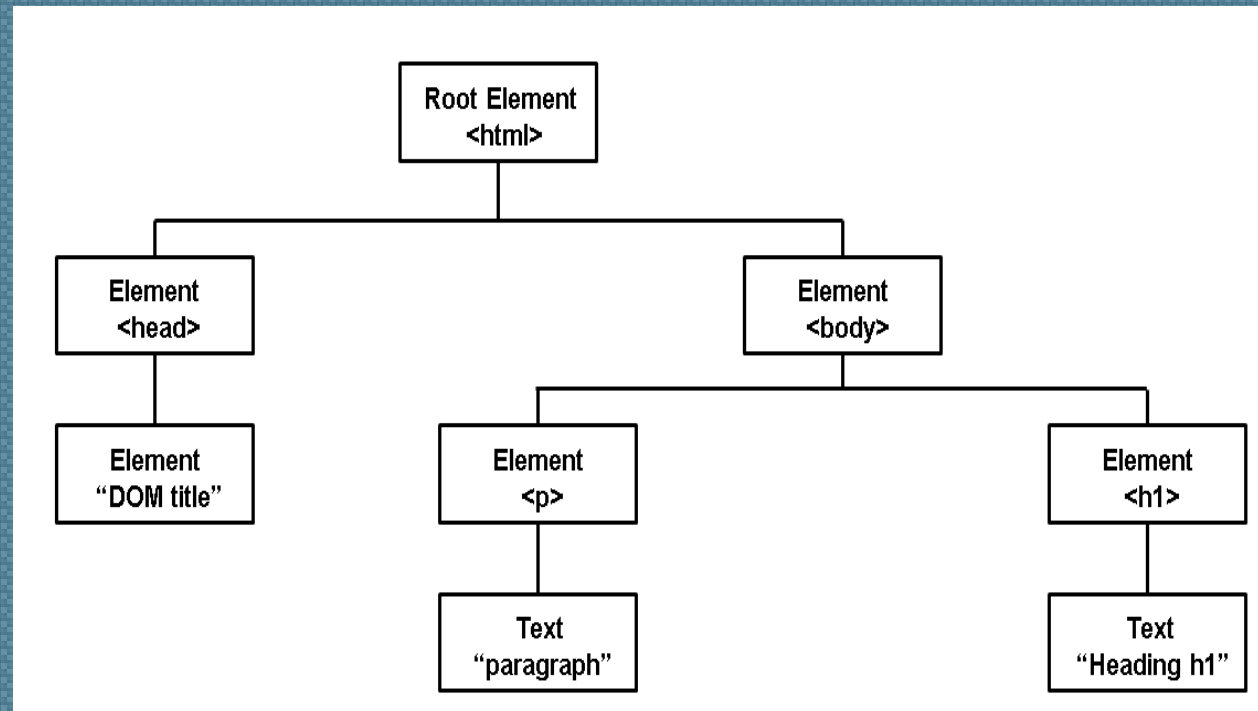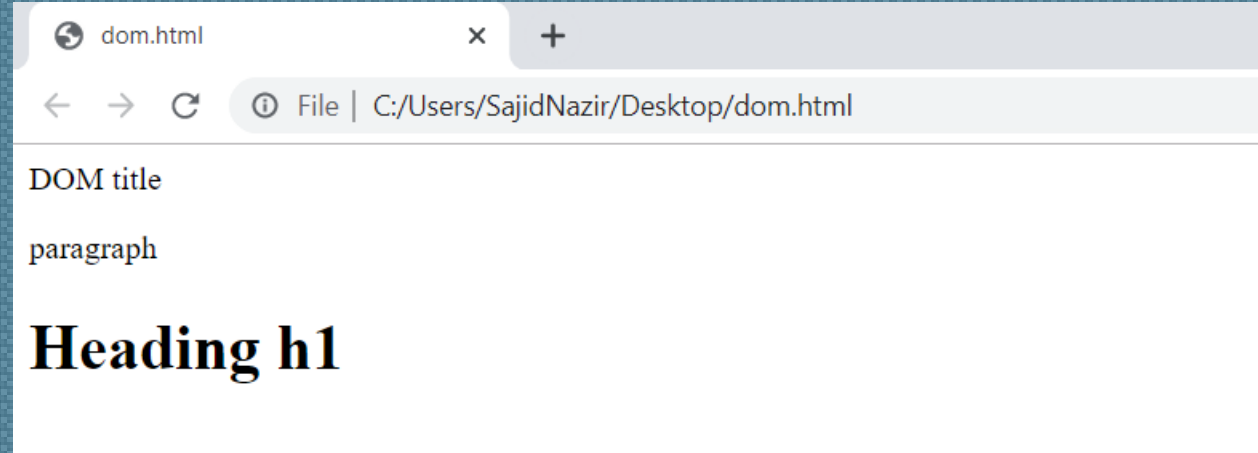➢ Active learning
➢ Simulations

The Solution

- Open plan environment
  - Whiteboards
  - Full visibility
  - Active learning
- Tutor support
- Language and Problem
  - Java
  - Document Object Model

Document Object Model

```html
<html>
    <head>
        DOM title
    </head>

    <body>
        <p>
            paragraph
        </p>
        <h1>
            Heading h1
        </h1>
    </body>
</html>
```
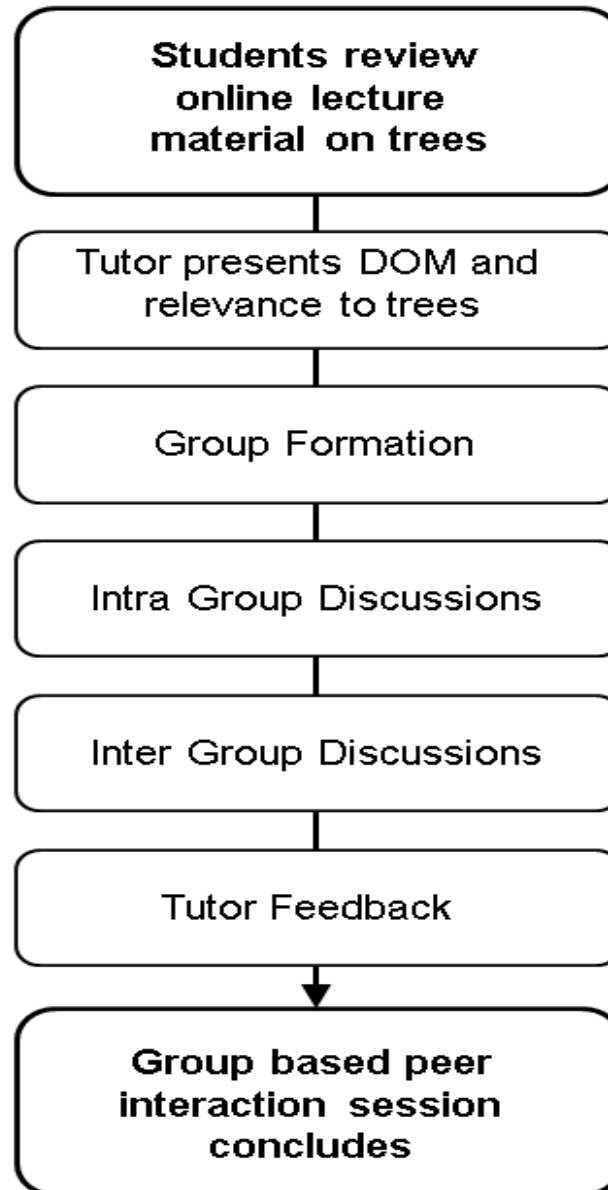
Collaborative Learning

Intra-group Interactions

- Design a solution
  - Start interactions
  - Iterative refinement
  - Refined solution
- Group dynamics
- Identifies weak and strong students
- Pseudocode on whiteboards

Development of a Solution

```
Public class ImpTree<T> extends Tree<T> {

    private class Node {

        T data;
        LinkedList<T> children;

        public Node (T data) {
            this.data = data;
            this.children = new LinkedList<>();
        }

        getData();
        getChildren();
        setChildren();
    }
}

    root = null;

    root () {
        return this.root;
    }

    Children() {
        return root.getChildren();
    }

    AddNode (String element) {
        If (element.openingTag();) {
            If (size ==0) {
                This.root = This.element;
            } elif (size!=0) {
```
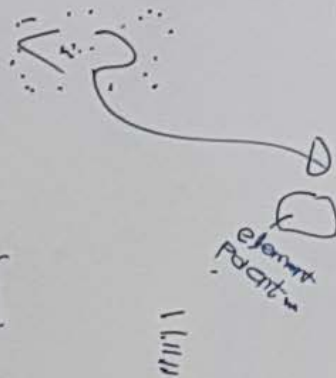
Arglist

= <...>

element
Pacint

Inter-group Interactions

➤ Tutor as moderator
➤ Discussion with other groups
➤ Peer evaluation
- Identifies weaknesses
- Exposes tradeoffs
- Better approaches emerge

Evaluation

➢ Student Feedback
➢ Student Experience
➢ Improvement in Results

Evaluation

Module	Location	Pass rate (%)
Data Structures	ALC	85.4
Data Structures	GCU	79.6
Programming 2	ALC	81.8

Conclusion

➢ Peer interactions facilitated by creating random groups

➢ Devise a group solution to the given problem by making use of whiteboard

➢ Students understand the complex concepts through group interactions

➢ Solutions available to the instructor and peers to see, comment and improve upon

➢ Encouragement to share and comment on ideas

➢ Improved student learning experience

Thank you for your attention

Questions