Role-Based Meets Problem-Based for Software Engineering Learning

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Software Engineering (SE) Study

- Computing Discipline
- Engineering Discipline
- Professional Practice

Arts

Sciences
Existing PBL Practice in SE

- **Action-oriented**
  - *Capstone projects* as a form of small group PBL, such as [4], [6], [7], [8] (some with physical environment of future workplace)
  - *Studio-based approaches* which *gradually* integrate SE study throughout the duration of a degree in different levels, such as [9], [10]
Problems in Existing PBL in SE

• Often focus on single perspective, e.g. as a problem solver
• Less emphasis is given on soft skills for professional practice, such as
  – Communication skills
  – Management skills
  – Change management skills
  – Negotiation skills
  – Quality management skills
  – Etc.

Developers (23)
Developer coaches (5)
Clients (UG) (5)
Client coaches (G) (5)
Auditors (G/industry) (15)
SQA manager (G/industry) (1)
SQA trainees (UG) (4)
Socialization team (UG) (2)

G – Graduate
UG - Undergraduate

Requirements (4)  Design / Prototype (4)  Code / Test (6)
(Split into 3 iterations)  Deploy / Maintenance (3)
Bonding, Setup (2)

Project with SQA (19 weeks)
(Note that the requirements were permitted to change for the first 10 weeks of the project to capitalize upon feedback from multiple perspectives to improve the requirements and for teams to learn how to manage change)
GSD Focal Points

• Quality through collaboration and competition

• Role-based learning
  – Clients
  – Client coaches
  – Developers
  – Developer coaches
  – Software quality assurance (SQA) manager
  – Auditors
  – Socialization team
  – SQA trainees
Responsibilities and Competencies in GSD Model (1)

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
<th>Skills and Competencies</th>
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</thead>
<tbody>
<tr>
<td>Clients</td>
<td>- Own and manage requirements</td>
<td>- Analytical skills for problem solving</td>
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<td>- Solicit candidate software systems to meet the requirements</td>
<td>- Negotiation</td>
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<td>- Conduct acceptance test</td>
<td>- Project management</td>
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<td>- Select the systems that of highest quality to further</td>
<td>- Feasibility study and project selection process</td>
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<td>- Interpersonal and communication</td>
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<tr>
<td>Client Coaches</td>
<td>- Mentor the client teams to baseline the requirements and manage changes</td>
<td>- Analytical skills for problem solving</td>
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<td>- Formulate test plans</td>
<td>- Negotiation</td>
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<td>- Guide selection process</td>
<td>- Project management</td>
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<tr>
<td></td>
<td></td>
<td>- Feasibility study and project selection process</td>
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<td></td>
<td></td>
<td>- Risk management</td>
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<td></td>
<td>- Conflict management</td>
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<td></td>
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<td>- Interpersonal and communication</td>
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## Responsibilities and Competencies in GSD Model (2)

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
<th>Skills and Competencies</th>
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</thead>
<tbody>
<tr>
<td>Developers</td>
<td>- Develop a software system to satisfy the requirements</td>
<td>Analytical skills for problem solving</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>Negotiation</td>
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<td></td>
<td>-</td>
<td>Design</td>
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<tr>
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<td>-</td>
<td>Programming</td>
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<tr>
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<td>-</td>
<td>Change management</td>
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<td>-</td>
<td>Interpersonal and communication</td>
</tr>
<tr>
<td>Developer Coaches</td>
<td>- Mentor developers with project planning, analysis, design and implementation activities</td>
<td>Analytical skills for problem solving</td>
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<td>- Conduct code walkthrough to inspect coding problems</td>
<td>Negotiation</td>
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<td>- Review auditor comments and suggest to the developers how to improve the developed system</td>
<td>Change management</td>
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<td>- Review test cases and testability matrix diagram</td>
<td>Conflict management</td>
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<td>Quality management</td>
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<td>Interpersonal and communication</td>
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</tbody>
</table>
## Responsibilities and Competencies in GSD Model (3)

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
<th>Skills and Competencies</th>
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</thead>
<tbody>
<tr>
<td>SQA Manager</td>
<td>- Facilitate auditing process of quality auditors</td>
<td>- Project management</td>
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<td>- Track and report project health check from feedback obtained from quality auditors</td>
<td>- Quality management</td>
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<td>- Risk management</td>
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<td>- Conflict management</td>
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<td></td>
<td>- Interpersonal and communication</td>
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<tr>
<td>Quality Auditors</td>
<td>- Independently check the processes and products of each development team</td>
<td>- Project management</td>
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<td>- Provide feedback to assure and improve quality</td>
<td>- Quality management</td>
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<td></td>
<td>- Review the requirements document at regular periods</td>
<td>- Risk management</td>
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<td>- Interpersonal and communication</td>
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Skills and Competencies of Different Roles

- **Clients and Client Coaches**
  - Feasibility Study and Project Selection Process
  - Conflict Management
  - Risk Management

- **Developers and Developer Coaches**
  - Analytical Skills
  - Negotiation
  - Design
  - Programming
  - Change Management
  - Conflict Management

- **Quality Auditors and SQA Manager**
  - Project Management
  - Interpersonal and Communication
  - Risk Management
  - Conflict Management

- **Other Roles**
  - Project Management
  - Interpersonal and Communication
  - Risk Management
  - Conflict Management
Role-Based Meets Problem-Based in Thai Software Engineering Classes: Local Adoption of GSD
Lesson Learned (1)

• Students took a shorter learning curve in the problem analysis phase, primarily as they were more enthusiastic.

• Students were more motivated to deliver the software solutions to the problems that were initiated or given by someone else through encouraging collaboration.

• Less demanding on the teaching assistants and the instructors of the course to clarify the requirements.
Lesson Learned (2)

• Role-playing is a very suitable method for the students to explore the issues involved in complex social situations from different perspectives.

• Role-based together with PBL enables the assimilation and practice of a broader set of skills and competencies, as required for different roles in software development.
Steps to Tailored a Local Class Setting

Step 1: Prepare *project plan* and line up *expected deliverables*.

Step 2: Prepare *computer supported collaborative work environment and tools*.

Step 3: Let the students *team up*.

Step 4: Arrange project kick off to *declare roles and responsibilities* of different teams.

Step 5: *Create social networks* among different teams to share a goal by using electronic communication tools, such as a wiki, to facilitate collaborative work.

Step 5: *Encourage* the students to do their work through *collaboration*.

Step 6: *Monitor the work and interaction* among different teams as the project progresses and mentor when necessary. This can be done by periodically checking the work products that are uploaded to the wiki or the deliverables to track project progress. In addition, students may also be asked to upload their minutes of meetings so that the frequency of the communications can be monitored.

Step 7: *Conclude and evaluate* the results of the project and skills learnt for different roles.
GSD 2008 Website

http://atlantis.seidenberg.pace.edu/wiki/gsd2008
References


