Architecture Students Experience on Optimizing Building Design using BPS – Lesson Learned

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BPS utilization in architectural education [1-14]

- BPS are given parallel to the studio design course but have not implemented in design process
- The ideal BPS software has to be easy to understand for early level architecture student
- Utilization is minimal for undergraduate students in Indonesia, and recently introduced in Universitas Trisakti
- Dialux is a free BPS software in lighting analysis that widely used in previous research in Indonesia

**Study purpose:** To evaluate students’ theoretical knowledge of passive lighting design strategies and experience using Dialux as a lighting simulation tools and to determine the relationship between theoretical knowledge and selected lighting passive design approaches, in order to prepare better learning experience of Building Performance Simulation for the next term
Building Performance Simulation and Design Process [2, 3, 7, 15-23]

- Architects are expected to simulate in early design stage
- BPS as a tool for design process to achieve high performance goal
- BPS usage in architectural education can increase student’s awareness of the implication of their design
- 2 approach in BPS learning in architectural education:
  - Domain specific – as experts who understand building physics behind the simulation process
  - User-centered – as a performer who able to run and interpret the simulation result or as a consumer who only able to interpret the result

Passive Lighting Design Approach [24-28]
Passive design approach emphasize on a low energy consumption design strategy and contribute to occupant’s comfort
• **Respondents**
33 undergraduate students of Building and Environmental Simulation elective course from February – June 2020

• **Data collection**
Questionnaire with 6-point Likert Scale answer options and Students’ final project posters

• **Data analysis**
Descriptive method for students’ experience and Pearson correlation are used for analyzed the relationship between design approach and theoretical knowledge.
FINDINGS AND DISCUSSION

Table 1. Pearson Correlation between Theoretical Knowledge and Design Approach variables

<table>
<thead>
<tr>
<th>Variable 1 (Design Approach / DA)</th>
<th>Variable 2 (Theoretical Knowledge / TK)</th>
<th>Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA - Opening Position</td>
<td>TK - Opening Position</td>
<td>0.396</td>
<td>0.022</td>
<td>33</td>
</tr>
<tr>
<td>DA - Opening Size and Amount</td>
<td>TK - Opening Size and Amount</td>
<td>-0.085</td>
<td>0.637</td>
<td>33</td>
</tr>
<tr>
<td>DA - Window Shading</td>
<td>TK - Window Shading</td>
<td>-0.056</td>
<td>0.758</td>
<td>33</td>
</tr>
<tr>
<td>DA - Glazing Properties</td>
<td>TK - Glazing Properties</td>
<td>0.220</td>
<td>0.219</td>
<td>33</td>
</tr>
<tr>
<td>DA - Surface Properties</td>
<td>TK - Surface Properties</td>
<td>0.238</td>
<td>0.182</td>
<td>33</td>
</tr>
</tbody>
</table>

Figure 1. Students’ experience using Dialux as lighting simulation tools

Reference: Author’s own work

Figure 2. Students’ theoretical knowledge about lighting passive design approach

Reference: Author’s own work

Figure 3. Selected lighting passive design approach

Reference: Author’s own work
CONCLUSIONS

• Students have difficulties in understanding theoretical knowledge or numerical calculation behind the simulation process, therefore:
  • Theoretical knowledge learning in Building Physics course need to be improved
  • BPS tools for undergraduate students have to be selected based on the ease of use and availability of online/digital learning source for self-study

Dialux is appropriate for undergraduate students because of its ease of use and many learning sources available online, by its developer and users.
REFERENCES

Thank You