HackEd: A Pedagogical Analysis of Online Vulnerability Discovery Exercises
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Research Questions
Do hacking exercises follow pedagogical best practices?
What challenges do exercise organizers face when applying these principles?

Exercise Criteria

- Educational – Intended to teach, not purely competitive
- Hands-on – active practice
- Online – publicly accessible
- Popular – Tranco/Alexa rank

Pedagogical Dimensions

 Connecting to Prior Knowledge
Personalization: Does the exercise provide challenges tailored to student age or experience?
Utilization: Does the exercise leverage knowledge from prior challenges to solve later ones?

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 Results
- Difficulty/point indicators were common
- Not always optimal
- Almost all exercises have concept progression

 Conducive Learning Environment
Peer Learning: Does the exercise provide support for team formation or an online discussion forum?
Inclusive: Do challenges contain extraneous load? Is supportive terminology used to reassure students?

 Results
- Difficulty/point indicators were common
- Not always optimal
- Almost all exercises have concept progression

 Results
- Many exercises lacked clear structure
- Stories commonly used to provide context
- Few exercises included realistic challenges

 Results
- Secure development practice was uncommon
- Feedback is rare
- Students can get help from the community

 Results
- Very few exercises guided transfer beyond “How”
- Most exercises provided additional materials

 Recommendations
1. Support metacognition through prompts to predict and reflect.
2. Use a graphical syllabus to provide structure.
3. Incentivize creating educational elements in community submissions.

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