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### Description and Evaluation of an Interactive Jeopardy Game Designed to Foster Self-Assessment

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#### Abstract

Basic clinical skill courses require students to progress from early information acquisition toward the ability to synthesize and modify the information for various clinical scenarios. In our program, graduate physical and occupational therapy students obtain practice with this clinical reasoning process during a classroom version of the Jeopardy! game. This interactive game show format offers a low-risk environment that encourages student participation. The students divide into two interdisciplinary teams, and each team elects four persons to formally answer the questions. These spokespersons take turns selecting a category of questions. Since all students are assigned to a team, even those not actively answering questions are still involved in the problem solving process. Category topics include areas such as physiologic changes, exercise prescription, abuse, discharge planning, community services, patient education, safety, and caregiver preparation. Each team selects a topic area and chooses a monetary value for the question. The instructor reads a clinical scenario and students work together to quickly provide an answer. The complexity of each scenario increases as the dollar value increases. If a student team answers incorrectly, incompletely, or exceeds thirty seconds to answer, the other team may answer the question. The team interaction creates opportunities to provide feedback to peers on the accuracy, appropriateness, and timeliness of their clinical recommendations. The level of friendly competition, combined with the rapid pace of the game, encourages students to learn from each other as they practice the clinical decision-making process.

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#### Introduction

*For three hundred dollars, answer the following question: How can instructors implement the key elements of adult learning while encouraging students to self-assess their competence with the information presented to them in a professional education course? The answer: Put them in Jeopardy!* Research suggests that adult learners may not respond as well to traditional, instructor-initiated educational approaches.<sup>1-3</sup> Instead, these students prefer more interactive teaching styles that allow student and instructor to work as a team to accomplish mastery of the content. Adopting teaching techniques designed to actively engage students in self-directed learning might result in better comprehension and retention for adult learners than can be achieved with traditional strategies.<sup>4</sup> This paper describes the use and evaluation of a computerized game based on the televised show Jeopardy as a self-assessment tool for graduate level occupational and physical therapist students who are

enrolled in a clinical sciences course.

#### Adult Learners

Most physical and occupational therapy students enter their professional studies after spending many years in a traditional pedagogical background. Pedagogy, defined as the science of teaching is characterized by the instructor holding a higher level of authority and responsibility for learning than is required of the actual learner.<sup>5</sup> A common analogy to describe this type of learning is to compare it to the actions of a sponge. In this example, there is a one-way infusion of content from the teacher, which the students absorb and later produce when requested. Successful learning is often determined by how closely the responses produced by the students match the information originally provided. The authority to decide which content is the most important for the students' future practice, present this information, and finally assess their level of mastery of the material rests

with the teacher. This limits the students' role to one of passive participation. This educational approach may not be the best choice to meet the needs of the students attracted to the allied health professions. Although the backgrounds of students enrolled in our programs may be quite divergent, they usually possess one element in common. Whether due to their advanced chronological ages, previous employment experiences, or the number of years already invested in an academic environment, most professional program students meet Knowles' classification as adult learners.<sup>1</sup>

The adult learner designation is not restricted by age or educational level. Any person who brings into the classroom a past that is rich in experiences they can apply to their learning qualifies for this designation. According to Knowles, the conventional pedagogical approach to classroom instruction is not as effective with the adult population. Adult learners value self-directed education where the curriculum design allows them to set their own learning goals. Knowles states, "adults have a readiness to learn those things that they need to know in order to cope effectively with real life situations."<sup>1</sup> Adult learners tend to question the content they are taught, both in terms of its accuracy and to identify how it will be useful in their future practice. They prefer teaching techniques that allow the learner to apply information to solve a real-life problem, to address a gap in clinical knowledge, or to prepare them for higher level of practice.<sup>6</sup> According to Kolb's experiential learning theory, adults interpret and reflect upon things that happen in the world around them according to the cultural, moral and ideological viewpoints held and their previous life experiences.<sup>7</sup> The ability to actively participate in the process of locating appropriate resources, selecting their preferred method for learning, and establishing the criteria for demonstrating mastery of the content is important to them. This approach engages them as information seekers who are capable of making their own decisions and value judgments about the information.

Students begin to engage in the process of self-directed learning when faculty create links between what the students already know and what they need to know for their new professions.<sup>1</sup> For this to occur, there must be a subtle shift in the way the roles are defined for the instructor and the students. The instructor's role changes to one of facilitator and mentor rather than remaining identified as an absolute expert. The adult learner's role requires an increased investment of time and energy devoted toward mastery of the course material. The use of interactive educational techniques allows students and instructors to share control over determining how much content must be learned before deeming the students to be educated thoroughly enough to safely apply their information to patients in a clinical environment.<sup>8</sup>

### Integrating Games into the Curriculum

The educational methods used in professional programs have been influenced by the growing demands placed on health care providers. As students progress through a professional curriculum, experiential learning opportunities require students to practice the skills of information retrieval, sorting, and application that are an essential part of the transition from novice to expert learner.<sup>9</sup> Games, accompanied by feedback from instructors and peers, add an exciting and novel element to professional education. The literature suggests that adult learners derive greater meaning from their learning experiences if they are given time to interact and make their own connections with the content.<sup>10</sup> The outcome of a group gaming experience is heavily influenced by the willingness of the students to take on responsibility for their own learning.<sup>11</sup> Ford and Brown caution that game-based approaches are more effectively used as strategies for experienced learners to review content rather than with novice learners to convey new materials.<sup>12</sup> Results of a 1997 national survey of information technology in higher education showed that a sizeable percentage of faculty members already use multi-media, computer simulations, or CD-ROM based materials during classroom instruction.<sup>13</sup> A computer-based Jeopardy simulation is a natural extension of these existing classroom methods. Readily available web-based computer templates allow faculty to customize the Jeopardy game for use in any course. We used a publicly available website found at: <http://www.jmu.edu/madison/teacher/jeopardy/jeopardy.htm> to create a template for an entry-level clinical skills and decision-making course.<sup>14</sup> Technical requirements for developing the game require a minimum of 256 MB RAM, 40 GB hard drive, the latest version of Internet Explorer, an Intel Pentium 4 processor, and a minimum of a 6 x 6' display screen. The size of the screen varies with the room configuration and the audience numbers. This type of technology is commonly available at the university level.

### Developing the Jeopardy Questions

We used the Jeopardy game as a review tool for occupational and physical therapist students enrolled in a required first year course, *Introduction to the Clinical Process*. This course teaches many basic clinical skills, including vital sign assessment, transfers, patient interactions, interviewing techniques, documentation, and the basics tenants of clinical reasoning. The educational objectives developed for the Jeopardy experience assessed the students' ability to:

- self-assess their level of knowledge in relation to that of peers
- reflect upon their personal reasons for choosing an active or a passive participation role.
- critique the effectiveness of the Jeopardy teaching tool in enhancing student skill in clinical decision-making.

Through its interactive questioning format, Jeopardy creates opportunities for students to demonstrate their mastery of important content, apply the content to patient-care scenarios, and explore their attitudes and beliefs concerning the clinical population to which the questions apply.<sup>15</sup> Jeopardy style questions require students to display content mastery that goes beyond mere memorization of facts. Each question category includes the three domains of learning, cognitive, affective, and psychomotor, at varying difficulty levels according to Bloom's Taxonomy.<sup>16</sup> Students must engage in open-ended reasoning to generate questions to fit the provided answers. An example shows how the questions included in a category labeled, "*You're getting transferred!*" can address content from related areas in a manner that encourages clinical reasoning.

The first question provides a concrete statement in the form of an answer, such as "This is the average blood pressure range below which therapists may suspect the condition of hypotension is present in an older adult." Students must respond with a fact-based question such as, "What is a decrease in standing systolic blood pressure of 20 mm Hg or more?"<sup>17-18</sup> This type of question, integrating materials from the cognitive domain, ranks as a lower level knowledge based question because it assesses the recall of facts without any application component.

A second question in the same category can be worded in a way that requires a much higher level of thought and clinical decision-making. By providing a multi-step answer, "identify, justify, and perform the most appropriate type of bed to wheelchair transfer for an 85 year old person who underwent a postero-lateral right hip replacement four days ago," the learner must process a great deal of information from all three domains at varying levels of difficulty in order to arrive at an appropriate response for the scenario. First, they need to mentally review the potential types of transfers and any possible limitations due to patient precautions related to the surgical procedure. Next, they must consider the age and recent post-surgical status of the patient to determine whether these factors affect the decision. Finally, the learner must verbally rationalize their decision and then demonstrate the chosen option, including patient education and environmental adaptation as appropriate.

Should this question come up as a 'Daily Double' on the computer game board, the person who simulates the patient might unexpectedly faint, become nauseated, or perform some other unexpected activity during the demonstration of the psychomotor skill. This unanticipated behavior from the patient requires the learner to perform an immediate situational analysis followed by a judgment concerning the need to modify the original intervention. Inclusion of affective domain questions focusing on ethical issues, supervision, and delegation issues allow assessment of students ability to

perceive, organize, and value the meaning of the content in their courses. Each of these abilities is a required component of their future professional practice. According to findings by Hoppes and Chesbro, students prefer coursework in which the instructor works closely with the students to develop clear links between the content itself and importance of this content in clinical environment for which this content will be necessary.<sup>19</sup>

Based on our experiences, we have identified two methods for question development. First, course instructors keep track of student questions generated by web discussion boards, lecture, and laboratory sessions. These student-generated questions usually target the areas of complex content or issues that require higher level clinical reasoning skills. The second method requires slightly more advance preparation. Students are required to submit three questions and answers from a particular reading, assignment, lab, or lecture. Although the quality, and thus the usefulness of these questions may vary, it usually generates enough good questions for at least one game.

Once created, the customized Jeopardy game is loaded onto a laptop computer and projected onto a large screen for classroom use. As with the popular game show, student audience members see a screen with five categories of questions. Additional game boards and category headings allow the amount and type of content to be tailored to fit the students' needs. Category titles should hint at the content of the "answers" contained within. For each category, the various dollar amounts of questions become progressively more complex, raising ethical, spiritual, and legal issues, as well as clinical situations that require students to actually demonstrate skills. "Daily Doubles" offer the teams a chance for immediate rewards for addressing challenging issues thoroughly. As in the televised game, the participants have to provide their responses in the form of a question. If one team answers incorrectly or incompletely, no dollars are earned. The other team is then allotted thirty seconds to begin to answer the question and earn extra dollars for their side.

For educational purposes, our rules vary from the official game rules whenever an incorrect response is given. We require students on the opposing side to first explain why the original response was incorrect before allowing them to offer their answer. This builds in opportunities for peer feedback, student-generated instruction, and critical reasoning. The game show format allows course instructors and peers to closely observe both reasoning and performance skills in a simulated clinical environment. Periods of prolonged observation are important in order for faculty to gain a sense of their students' abilities both individually and in comparison with other classmates.<sup>20</sup> The team design of our game provided a mechanism for the participants to self-assess their knowledge in particular areas while increasing their comfort with taking risks in front of their peers.

### Conducting the Game

Prior to the game, the instructor and students should work together to develop the rules of play. This game is usually conducted with two teams competing against each other but the format lends itself to individual use as well. In our team version, five students compete as a team against another team. If new team members are selected for each board, it will increase the number of students who can become involved. Our two-hour class period usually allows us to complete the categories on three game boards, so the total participation is limited to thirty students from the entire class. Classes with an enrollment larger than thirty students may wish to conduct the Jeopardy game during more than one classroom period.

We avoid a gender-based division and instead divide the class into two sections, with diversity of age, gender, and disciplines on each side. Any competitive game can become stressful for both views and participants, so instructors should take steps to manage this tendency before the game begins. Rather than emphasizing the inevitable end result of winners and losers, emphasize the game's function as a motivational tool to encourage further study.<sup>21</sup> Those who are not presently playing the game are seated behind one of the teams and encouraged to cheer 'their' team toward victory. The game experience is not formally graded but participation as a contestant or as a team supporter is counted toward the class participation portion of the grading scale. For both safety and noise control reasons, students must remain seated unless performing a clinical skill in response to a question. Adult learners usually prefer to develop their own strategies for answering questions. Some groups prefer to assign questions to members who feel that a particular content area is their strength, while others take turns providing answers that reflect the group consensus. The choice of strategy does not matter and teams may choose different approaches. The only requirement is that all team members must take a turn in answering questions. Instructors must frequently remind the participating teams and the student audience not to shout out answers to any of the questions.

### After the Game: Feedback and Reflection

Feedback is an important component in learning. Through participation in discussion and reflection, the students can use the game-based experience to assess both their clinical abilities and their reasoning skills. The timing of feedback is important. Some propose that feedback is most effective when it is provided immediately after the performance.<sup>22-23</sup> We believe that the impact of immediate feedback may be diluted due to the adrenaline generated by participation in a competitive game. In order to counteract that result, we provide both immediate feedback and opportunities for later discussion. Journaling, interacting with a small group in the classroom, or posting observations to an on-line discussion board allows students to individually and collectively address questions such as:

- How did my personal level of involvement and preparation help/hinder my team in reaching its educational goal?
- How well did I understand and apply the course content and how did I arrive at that conclusion?
- What strengths did I bring to the team experience? What were the benefits of functioning as part of a team?

### Evaluation of Jeopardy as an Instructional Strategy

Student feedback, both spontaneous and solicited, was overwhelmingly positive about this experience. Verbal comments, postings on the course web page, graded reflection assignments, and course evaluations emphasized that along with the fun, this experience caused students to better understand the roles they have in the educational endeavor. The feedback was grouped into five themes: a) competition aids self-assessment ability; b) added realism to self-assessment; c) discomfort with exposing true self in front of others; d) competition drives involvement; and e) information processing approach.

The themes generated through student feedback demonstrate that the educational objectives for this activity were met. The first objective established that Jeopardy participation would encourage students to reflect on their personal mastery of the course materials as compared to the level of preparation displayed by their peers. The increasing emphasis on interdisciplinary practice in the allied health professions requires practitioners to work together as a team in patient care.<sup>24</sup> Teamwork is enhanced when participants feel comfortable in expressing what information they can or cannot offer the group. The ability to honestly and critically perform self-assessment is an essential skill for future practice. Student feedback indicated that this process helped to identify areas of weaknesses that required remediation.

The second educational objective required students to examine and evaluate the reasons behind their choices concerning participation in the Jeopardy game. In a professional curriculum, adult learners have a responsibility to the group.<sup>25</sup> Through participation, they educate and learn from one another. Examination of our student feedback showed that although they made different participation choices, the underlying reasons focused more on individual benefit than on the impact their choice might have on the class as a group. Some saw participation as a way to gain an edge in academic preparation.

Through functioning as a team member, individuals could increase the likelihood of performing well on the final examination. The emphasis placed on winning reinforces that they viewed this activity as worthwhile

because a victory proved their level of mastery to an audience of peers. The potential benefit of their participation for fellow classmates who viewed the game was not mentioned. Those who chose not to participate did so for equally self-motivated reasons. Either the prospect of participation forced them to admit to a low

level of content mastery or they were held back by a fear of performing badly and leaving a false impression that they were unprepared. Despite their personal fears, none of the feedback included any negative comments concerning the student participants on the teams who *did* answer incorrectly.

**Table 1: Themes (underlined) and associated comments (in italics) from student feedback related to the three educational objectives.**

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| <p><b>Objective 1: Self-assess personal level of knowledge in relation to that of peers</b></p> <p><b><u>Competition aids self-assessment ability</u></b></p> <ul style="list-style-type: none"> <li><i>Getting the first question wrong was embarrassing and made me stop and think through the entire question better before I answered in the future. Then I started getting them right.</i></li> <li><i>When I gave an answer and it turned out to be right I felt like, "Yes! I know this stuff."</i></li> <li><i>Answering the questions to myself in the audience made me feel as smart as the ones who were on the team.</i></li> </ul> <p><b><u>Added realism to self-assessment</u></b></p> <ul style="list-style-type: none"> <li><i>I decided I was better prepared for the exam than I thought and it made me worry less.</i></li> <li><i>I always think I don't know as much as everyone else but this type of review was a fun way to see that all my studying had paid off.</i></li> <li><i>I felt sort of relieved when I could think of a better answer than someone else on my team because I felt like my knowledge was making a real contribution to my team</i></li> <li><i>If I couldn't answer questions in an area, even the \$100 easier ones, then I knew that I had to study that more, even if I had thought that I already knew it well.</i></li> </ul> <p><b>Objective 2: Reflection concerning their personal engagement choices</b></p> <p><b><u>Discomfort with exposing true self in front of others</u></b></p> <ul style="list-style-type: none"> <li><i>I didn't volunteer because I ... didn't want to let my team down since I wasn't very prepared.</i></li> <li><i>I felt somewhat passive as an audience member but I prefer that role.</i></li> <li><i>I didn't want to look stupid if I answered wrong so I just mentally answered.</i></li> </ul> <p>Competitiveness driving involvement</p> <ul style="list-style-type: none"> <li><i>I am the type of person who needs to always be really involved.</i></li> <li><i>I enjoy winning and wanted to be part of making that happen.</i></li> <li><i>I love winning and I like to participate in anything that makes me feel successful.</i></li> </ul> <p>Information processing approach</p> <ul style="list-style-type: none"> <li><i>...don't like 'on-the-spot' questions because I take a bit longer to process questions and formulate my answers</i></li> <li><i>I am an introvert and prefer to think independently instead of with a group.</i></li> <li><i>I am a methodical thinker and preferred taking more time to come up with complete answers.</i></li> </ul> <p><b>Objective 3: Critique this tool's effectiveness in enhancing clinical decision-making.</b></p> <p><b><u>Integration of content into practice</u></b></p> <ul style="list-style-type: none"> <li><i>I thought I really knew this stuff but I realized that I wasn't thinking through all of the issues in the patient-based questions.</i></li> <li><i>When I watched people demonstrate a skill I started to think, "What about safety?" and other things than just evaluating how well they performed the procedure.</i></li> <li><i>There was a time crunch to produce an answer and that is the way it is in the clinic. We had to think on our feet and argue wrong answers by explaining what should have been done and why.</i></li> </ul> |
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The final educational objective for Jeopardy intended that students would demonstrate improvement in their clinical decision-making skills as a result of this experience. Several students mentioned the need to evaluate many facts quickly and generate appropriate working hypotheses in order to arrive at a comprehensive answer.<sup>26</sup> The patient based scenario questions, combining cognitive, affective, and psychomotor components, required students to apply course content to a simulated patient within a restricted amount of time. Students found this attempt to duplicate the realities of clinical practice to be very beneficial.

The feedback may be shared in several ways. It can disseminate from student to course instructor and back again to individual student or from individual student to course instructors and peers. For the latter option, course instructors should assess the comfort level of their students with sharing personal information and may wish to make the peer component an option rather than a requirement. If peer-feedback is required, the written or posted discussions offer course instructors the option of blinding the responses to preserve student anonymity. Encourage students to provide feedback that is supportive; recognizing strengths and offering

suggestions on how to address content weakness perceived in them and in their classmates. This collegial dialog should examine whether the planned educational goals were met and identify any existing or potential barriers to the process.

### Conclusion

In our experience, the use of games as teaching tools fosters collaborative interaction with peers. Technology in classroom instruction offers one possible example of an enhancement, rather than a substitution, for traditional, instructor-led teaching in physical and occupational therapy.<sup>27</sup> Some educators shy away from using a teaching tool that does not have a solid foundation of evidentiary support. Rowitz points out that there is a lack of, "published reliability and validity with regard to the effects of what the games actually teach."<sup>28</sup> The literature contains a few articles addressing game-based teaching techniques but there is no proof that these methods are more effective at enhancing learning than traditional teaching approaches. Despite this lack of

definitive proof, information about how adult learners prefer to interact with information suggests that the group interaction, active participation, and rapid information processing demanded by participation in games should have a positive influence on student learning and retention.<sup>4,15,29,30</sup> Faculty can use the format of the game question to reinforce important concepts such as people-first language and use of a whole person approach in the clinical decision-making process.

Although the time and energy required to design and conduct the game may be considerable, there are rewards. This format allows instructors to directly observe not only how well students handle the material but also provides a chance to see how they link previously learned content with new material to make well reasoned clinical decisions. This enjoyable game ultimately serves the faculty as a comprehensive evaluation tool of the actual learning that occurred during the course.<sup>31</sup>

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