

Case Studies 1B – PHT 5615
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About the Author:

After receiving a BS in Physical Therapy (PT) from “Jan van Essen” Academy for physical therapy in Holland in 1982, I moved to the United States to start my Physical Therapy career. I obtained a Master’s Degree in Sports Medicine from the US Sports Academy in Daphne, Alabama in 1986, and a Doctorate in Education in Instructional Technology and Distance Education from Nova Southeastern University, Ft. Lauderdale, Florida in 2000. After practicing in a variety of settings with different patient/client populations and part-time teaching for four (4) years, I accepted a full-time faculty position at the Nova Southeastern University Physical Therapy program in 1995. My teaching responsibilities included musculoskeletal content (one of the cases I used for this Problem-Based Learning (PBL) Portfolio), as well as general physical therapy history and ethical practice, evidence-based practice, research, women’s health, and prevention and promotion of Health, Wellness and Fitness using a PBL format for most all of them. Since January 2003, I have been employed as the Director of Clinical Education at Elon University in Elon, North Carolina.

Part I: Introductory Information

A. Institutional

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|--|-------------------------------------|
| 1. Name of university: | Nova Southeastern |
| 2. Total enrollment: | 75 students (first and second year) |
| 3. Is the institution public or private? | Private |
| 4. Carnegie classification: | Doctoral/Research—Intensive |

B. Individual

- | | |
|--|---|
| 1. School: | Health Professions Division,
College of Allied Health |
| 2. Department/Division: | Physical Therapy |
| 3. Faculty Rank: | Associate Professor |
| 4. Highest degree earned: | EdD in Instructional Technology
and Distance Education |
| 5. Number of years teaching at college level: | 9 |
| 6. Awards received for excellence in teaching: | N/A |

C. Course

- | | |
|---|---|
| 1. Course Name: | Case Studies 1B |
| 2. Course abbreviation and number: | PHT 5615 |
| 3. Number of <u>semester</u> /quarter credit hours: | 7 |
| 4. Catalog description: | Continuation of case studies. Identify patient needs, gather and filter data to develop a patient problem list and goals, determines a diagnosis for musculoskeletal dysfunction. Case studies, small group discussions, laboratory practice, panels. |
| 5. Number of students typically taught in this course: | 33 |
| 6. In what year do student typically enroll in this course? | First |

7. This course is best described as:

a required course for majors

D. Problem-Based Learning

1. What percent of this course uses PBL?

at minimum 75%

2. How long have you been teaching the course using PBL?

6 years

3. Is the course designated as PBL in any official way?

Somewhat. In the catalog, the entire "Course of study" is described as a "modified problem-based format that combines traditional teaching and learning and case studies as the basis for instruction...."

Part II: Course Design

A. Rationale

The American Physical Therapy Association (APTA) states that an entry level physical therapist (a recent graduate from a physical therapy (PT) program) is able to use critical thinking skills to make independent decisions about patient care, without guidance or supervision, except with new or complex problems. PT graduates need to be able to identify and solve problems, must be life-long learners in order to keep their knowledge current, must be capable of high levels of critical inquiry and clinical reasoning, and must be capable of high levels of critical inquiry and clinical reasoning, and must function well in teams. These are all qualities that Fenwick identified as expectations of current employers of their new graduate employees. Mathwig, et al. as well, identified that employers of entry-level physical therapists look for strengths in time-management, professional and communication skills when making hiring decisions. These are all qualities we seek to develop in our PT students. Several sources describe that Problem-Based Learning (PBL) enhances these skills and characteristics. Thus PBL was a logical delivery format choice for me for the case used for this portfolio.

Our PT program was designed as a problem-based learning (PBL) curriculum, though the first class that entered in 1994 was a lecture-based learning (LBL) class. The second class that entered started with the PBL curriculum, and concurrently, the first class was converted to the PBL format.

As Norman and Schmidt indicated in their review, whether PBL students have a cognitive learning advantage over LBL students is not clear. PBL students do have a small, but significant benefit with clinical reasoning skills, and PBL has a significant benefit when satisfaction with the educational experience is measured. PBL has proven to enhance a student's ability for hypothetico-deductive reasoning (a process that uses "backward" thinking to prove a hypothesis true or false), critical thinking, working in a team, and lifelong learning. On the flip side, PBL can create anxiety in students because of the reported lack of guidance, for learning inefficiencies, gaps in knowledge, and the lack of correction of inaccurate information.

I agree with Blake et al. that PBL continues to offer benefits over LBL. For example, they showed that medical students who were taught using the PBL approach scored higher than the American average on the Step 1 and Step 2 of the medical board exam when compared to those who were taught using LBL. The latter group scored below the American average. Woodward, et al. compared practice behaviors of physicians who graduated from a PBL curriculum to those who graduated from a non-PBL curriculum; the PBL physicians were more likely to spend more time with their patients, referred more for psychological counseling (holistic patient care), were more likely to be practicing in general medicine, and be in group practice (team work). These are all qualities we would like our students to display.

Several authors provided further theoretical support for the use of PBL; proposing that the cognitive learning theory is a weak theory for the basis of PBL. Albanese identifies the information processing theory, the cooperative learning theory, the self-determination theory and the control theory as theories that provide a better basis for PBL. These theories support how using a PBL format can lead to the type of student behaviors our institution wants to develop in our students. PBL, because of its nature, offers distinct advantages over LBL, and because it offers the best hope for achieving the program's educational goals, PBL was the delivery method of choice for Case Study 1B-2.

B. Course Content

Course PHT 5615, Case studies 1B is a nine (9) week course and is delivered during the first year of the curriculum. Eight (8) weeks are used for student facilitations, and the last week is a testing week. The curriculum follows the clinical decision-making model. In the first year, the curriculum focuses on the initial patient-therapist interaction, tests and measures, evaluation, prognosis, identification of problem(s) and documentation. During the second year the students learn interventions.

The curriculum is also based on combined systems and the body area approach. The 1B semester represents the first nine (9) weeks of the second semester and focuses on the musculoskeletal system. It covers the body parts from the low back through the foot. The 1B course is divided into three (3) separate units, and the unit chosen for this particular portfolio is case 1B-2, which covers the low back, pelvic girdle, pelvic floor hip, and the gastro-intestinal, uro-genital and reproductive systems.

The case for this portfolio consists of an initial stimulus, and an additional three (3) parts, giving sequential and more detailed information about the case, as well as case objectives. This is done to guide the students' learning and to present additional challenges as the case unfolds.

C. Instructional Practice

Students received the initial case stimulus on Friday, and inline with the PBL approach, were expected to do preparatory readings based on their own perceived needs for the first facilitation on Monday. During consecutive group facilitations, additional case information would be made available to the students by the faculty in answer to specific case related questions and/or via the Internet.

The faculty that served as tutors for small groups of up to 12 students received a faculty tutorial in which objectives, areas of content emphasis, resources, quiz questions, and enrichment activities were defined. Each facilitator also received a facilitation manual that contained the different knowledge areas (i.e. anatomy, physiology, epidemiology, medical interventions, etc.) that were to be addressed by the students with standardized type of questions that could be asked to facilitate student interaction and thinking. A faculty committee created this facilitation manual in an effort to ensure more consistent facilitation techniques between faculty members.

Initially, practical skills were facilitated and not demonstrated to maintain the pure PBL delivery format. Students were encouraged to use resources available in the library such as videos, books and professional journals, as well as the Internet, and faculty. Faculty would answer questions, provide feedback, and give corrections only if students could demonstrate they had attempted to work through the problems. Students were also expected to practice psychomotor skills independently in small group format to further increase their skill level.

Because of a persistent student complaint about differences in faculty feedback and facilitation of practical skills, I started doing inquiry seminars to demonstrate certain specific psychomotor skills. Though this type of instruction for psychomotor learning deviates from a pure PBL approach, it is supported by recent research that showed students specifically instructed in the amount of pressure to use for US treatment, as compared to those not instructed, were more accurate in their perception of pressure used, and had better retention skills. The use of inquiry seminars is also one of the three ways in which PT curricula integrate the PBL approach.

In the initial years of using the PBL approach, students were not given a list of required textbooks, in keeping with the pure PBL delivery format. Instead they got a list with recommended texts, and they were expected to find those that worked best for them. Our intent was not to limit them in their search for resources and learning opportunities. Unfortunately, first year students simply asked the second year students what texts they used, and got those texts. Many students didn't buy textbooks at all, and instead copied pages (or entire books). The students who did buy books complained that their book costs were astronomical. When we compared the cost of our book lists with the cost of book lists for other programs within the health professions' division college of allied health, our students' costs were more than five times higher. We are now providing the students with a list of both required and recommended books.

Initially, students did not receive any objectives. One of the major complaints from the students was that the PBL format caused inconsistencies in material learned by small groups. I started giving students objectives for the case. The objectives were initially very broad. They are now more specific, in an ongoing attempt to increase consistency of content. The current forty-seven (47) objectives for this case cover all aspects of Bloom's taxonomy of learning. Students and facilitators use them to ensure appropriate content is addressed. The objectives are divided into cognitive, psychomotor and affective domains, and they are congruent with the enrichment activities for the case, and with the written and practical exam.

A decision was made to add anatomy lectures to ascertain that students were at least exposed to the same information and in an attempt to increase their anatomy knowledge base. This lack of basic anatomy knowledge was identified via clinical instructor (CI) and student feedback, as well as from written examination results. The two hour every other week lectures highlighted the critical areas of anatomy related to the case. Students were given upfront reading assignments, and were expected to actively participate in the anatomy lecture. There was not enough time in those lectures to actually reach all of the anatomy content to the students, so students were still expected to do the learning of anatomy detail on their own. Students' acquisition of anatomy knowledge was tested via ten (10) anatomy questions included in the fifty (50) multiple choice (MC) question case exam. Though providing lecture-based content does not follow pure PBL format, a "hybrid" model is described and used in educational programs in which basic foundational sciences information is delivered through lectures.

Experts are capable of quick practical reasoning in complex and often ill-defined situations not only because of the informal knowledge they have (which is being emphasized in the PBL delivery format), but also because they have greater in-depth formal knowledge (i.e. foundational sciences). Rather than focus on hypothetico-deductive (backward) reasoning, experts move cyclically between backward and forward reasoning skills to quickly form conclusions. Norman and Schmidt conducted a study using electrocardiogram findings, and concluded that the forward reasoning group had 42% accuracy, and the backward reasoning group 59% accuracy. The forward reasoning group took too much time, gathering too much information. As students tried to explain all this information, they got sidetracked from their original thinking.

Physical Therapy students are expected to perform at entry-level rather than at a novice level, demonstrating the ability to make independent decisions about patient diagnosis, evaluation, prognosis and intervention. Though entry level is not the same as expert level, I believe it is important to encourage the use of skills. Thus students need to learn to use both hypothetic-deductive (backward), as well as forward reasoning skills. To encourage this, students complete clinical patterns to assist them in the process of differentially diagnosing between similar signs and symptoms. A clinical pattern is a form that the students complete as they study a variety of diagnoses that might be applicable to the case. The form includes columns where students enter information about signs and symptoms, tests and measures that would support a specific diagnosis, tests and measures that would refute a specific diagnosis, tissue involved, and pathology/physiology pertaining to either the diagnosis or a specific sign

or symptom. I introduce the students to the use of the clinical patterns in a large group to ensure they all get the same information. The clinical patterns can be used either with forward or backward reasoning. For example, the students can start with a list of appropriate differential diagnoses, and then search backward to identify signs and symptoms associated with each, and to identify appropriate tests and measures to confirm or disprove a diagnosis in relation to the case presented to the students. Another option is to start with a particular sign or symptom and work forward from there to reach conclusions about the possible differential diagnoses.

In line with strategies used at McMaster University in Canada, which has used the PBL format in its PT curriculum since the 1970s, I incorporate three (3) inquiry seminars; one related to assessment of joint mobility of the lumbar spine and pelvis. I expect students to be prepared to ask questions, discuss precautions and contra-indications and screen each other before actually practicing skills on each other. Delivery of the entire PT curriculum has been gradually changing from pure PBL to a more modified approach. In 2002, we were mandated by the administration to completely drop the small group facilitation process, and to stop using the words PBL in our catalogues. This was related to the cost and labor intensiveness of using a PBL delivery format.

The consistent positive comments we get from non-Nova Southeastern University peers, clinical instructors and employees of our new graduates on our graduate surveys, indicate our students are great at thinking on their feet and at finding the information they need. They also function exceptionally well in groups, and have better initial clinical skills than their peers from LBL curricula. Using a PBL approach works in emulating the qualities we want in our graduates.

Examples of enrichment activities, multiple choice questions, the case stimulus and additional case information, a sample page of the facilitation manual, and a practical exam can be viewed online at http://www.nova.edu/~marianne/Samford_portfolio.htm.

D. PBL Context and Application

In this particular course, I applied the PBL approach to the instructional style used to present and facilitate course content. Students met in small groups of up to twelve (12) students. They had a case facilitator that was one of the faculty members. The case facilitators met before the case started, and at least once during the three week case to make sure the same content was covered in facilitation. The case facilitators received the case tutorial to assist them in guiding students in the appropriate case specific content, as well as the facilitation guide. This guide included general questions that challenge students' higher cognitive levels. Some examples of those questions are: "How do anatomy and physiology in this particular case relate to each other?" "What is the relationship between the biomechanics of the low back, and the occurrence of arthritis of the spine?" "Compare and contrast the physiology of inflammation and healing between acute arthritis and chronic degenerative changes."

Students received the case stimulus online, on Friday. The first case facilitation was on Monday. During the first facilitation small groups worked on identifying the facts associated with the case stimulus, brainstorm ideas about the possible causes, effects, pathology, differential diagnoses and other issues related to the case, such as therapeutic interaction with a patient who complains of incontinence, as well as workers' compensation issues. Based on the ideas generated, students explored their current knowledge about the case and identified what else they needed to learn. The learning needs were guided by facilitators to include the six (6) circles of movement science: anatomy, physiology, developmental, biochemistry, biomechanics, and behavior, as well as issues related to medical diagnostics, medical interventions, pharmacology and pharmacokinetics, epidemiology, prevention and promotion of health, wellness and fitness.

During additional lab hours and during the clinical rotation for this case, students continued to practice their tests and measures and evaluation skills. During consecutive facilitations, further content was covered related to differential diagnoses as they pertained to the lower back, pelvis, pelvic floor and hip.

Parikh, McReelis and Hodges found that immediate feedback in PBL was most appreciated and helpful for students, and that individual feedback, peer and group feedback respectively, were more helpful than grades, or written feedback. During one of the last small group facilitation sessions, students were “put on the spot” via an enrichment activity as an opportunity to think on their feet, and to give them immediate feedback from facilitators, peers and self. To select the enrichment activity, I had them randomly pick a number from the total number of enrichment activities for this case. An example of a cognitive enrichment activity is: “Compare and contrast two different pain theories, using anatomy and physiology as part of your rationale.” For a psychomotor enrichment activity, a student may be asked to “Demonstrate how you think Mrs. Mitose would get up from the floor and defend why she would do it this way. Use at least biomechanics, arthrokinematics, and anatomy as the basis for your defense.” The students did quite well self-assessing. I asked them to evaluate if the answer would deserve a passing grade and why, or why not, and to identify what the learning issues were in association with that particular enrichment activity.

With regards to my facilitation style, I received high praise from the students for the challenges I gave them to understand and integrate information at higher cognitive levels of thinking. They also expressed anger and frustration because as dictated by “pure” PBL methodology, I did not reprove incorrect information. Even when I spent time delineating the roles of the students and my role as a facilitator, some students still maintained that it was my responsibility to tell them if they were wrong, and that I was to know everything about the case I facilitated.

Throughout the facilitation, the case tutorial (which includes objectives for the faculty facilitators) was used as a guide to ensure that case content was addressed even if it isn’t covered in detail because students didn’t identify it as a learning issue. Students are tested at the end of the case with a case specific exam consisting of approximately fifty (50) multiple choice (MC) questions, as well as a practical exam. The practical exam is further described in the next section.

Part III: Student Understanding

A. Evidence of Students Achieving the Learning Objectives

Though students appreciated the immediate feedback, they didn’t feel comfortable when asked to give peer feedback; one of the learning objectives for the entire PT curriculum. Their peer feedback was general, vague and intended to be more positive than was warranted by the students’ demonstration of knowledge or skill. When asked if their peer answered/performed an activity satisfactorily, very few students actually provided helpful feedback. The general response was “great job!” Peer assessment continues to present a challenge in our curriculum.

For the first three to four years of the case, students, inline with findings by Treloar et al, complained that the exam questions were not compatible with what they had studied. These complaints happened during the time that I didn’t provide objectives to the students. In an effort to correct this, I created specific objectives, and made sure the exam questions were representative of those objectives. When writing the test questions for the fifty (50) MC question case exam; the three case leaders for the 1B semester verified for each other the questions were congruent with the objectives for the case. The exam was pilot tested by faculty who facilitated the case and if there was any concern that material related to a question was not addressed in facilitation, the question was removed. This way students got tested only on the material to which they were exposed, though it might be applied in a different context to test for carry-over of knowledge.

In an effort to test not only root memorization, but also problem-solving skills and application of learned material; the MC questions covered all the levels of Bloom’s taxonomy from memorization (know what) through analysis and evaluation (know how and why). It also included ten (10) anatomy questions. The anatomy questions were at minimum at the cognitive application and analysis levels.

The initial grading during the last time this case was offered, seven (7) of the thirty-four (34) students passed the entire written exam, seemingly, indicating that the students did not achieve the learning objectives. Review of the exam indicated most students did poorly on the anatomy questions, in line with the perceived lack of anatomy knowledge as expressed by students, clinical instructors and as reported in the literature. After eliminating poor questions (those with less than a .25 for point-bi-serial on the statistical analysis provided by the testing center) and allowing more than one answer on some of the most difficult anatomy questions, six (6) of the thirty-two (32) students failed the written exam. A point-bi-serial scores a question in its ability to correctly identify the ten percent (10%) highest scoring students on the exam. When a point-bi-serial is low ($< .25$), those students that correctly answered the question are not those that scored highest on the exam; suggesting the question needed to be further evaluated for quality and either re-written or eliminated for the next exam. No other apparent areas of weakness existed. The written exam correctly identified the at-risk students, indicating its effectiveness in evaluating students' learning.

Like the students in the study by Treloar et al. Our students also complained about the subjectivity of the practical examination. I addressed this in the practical exam, by having the same faculty grade the same skill for all students. Students rotated to different testing "stations" where they drew cards in a specific category, and then demonstrated the skill on the card. The categories for this exam included goniometry, manual muscle testing, gait and assistive device analysis, functional assessment, special tests and joint accessory testing. The cards were worded so the students had to have cognitive knowledge in order to successfully select the correct skill. For example, an exam card for special tests read: "perform a special test for a patient who sustained an unhappy triad injury to the right knee." The student was to identify a correct special test, and then perform the test on the "patient." Students had to interact with the patient as though this were a real patient-therapist relationship, including adequate therapeutic presence. If an incorrect skill was selected, the student failed that particular station.

A specific grading criteria, "met" or "not met" was created. Each criterion addressed only one grading issue. For example, a criterion might read "student maintains patient dignity," rather than "student maintains patient's dignity and safety." Furthermore, the testers made copious notes on the students' performance, and if there were any uncertainties about how to grade a performance, the grading was discussed with the testing committee—the faculty in charge of the cases for that semester. To be in compliance with our CAPTE recommendations, if a student used unsafe practices during the practical exam, it resulted in automatic failure for the entire practical. During the last practical exam, one student failed because of unsafe practice. The student was able to take a re-test after remediation, and passed.

Overall students did very well on this practical exam. Historically, seven percent (7%) to nine percent (9%) of the total fails the 1B-2 case practical exam. These generally are students that have done poorly on previous exams, an indicator of the effectiveness of the exam in correctly identifying weak students (validity). The above described changes have resulted in increased performance on the written exam, even though students continue to do poorly in anatomy. Students perform well on the 1B-2 practical exam, demonstrating adequate clinical skills.

One aspect where we might conclude that our students are not meeting the learning objectives is that our graduates tend to perform below the national and Florida averages on the national physical therapy licensing (NPTE) exam. Based on our outcome studies, the strongest indicator of success for the NPTE exam is the PT grade point average (GPA). Students that do well in their educational experience at NSU are more likely to pass the first time they take the NPTE exam. This, however, explains about twenty percent (20%) of the variance. At this time, there is no sure way to conclude what the cause is for this low performance on the NPTE exam. With the conversion to a large group presentation format, we will have the opportunity to investigate if PBL is or isn't a contributing factor to students' performance on the NPTE exam.

B. Reflection on the Evidence of Student Learning

Based on the success of the students on the practical exam, I can cautiously conclude that the inquiry seminars on practical skills are effective in enhancing students' psychomotor skills. Students improved on the gait analysis portion of the delivery format. Based on the improvement on the MC exam on topics related to joint mobility compared to last year's class, the inquiry seminar on this topic also seemed to enhance cognitive levels of students' knowledge. Since I have made more than one change at a time, it is impossible to determine which variable was responsible for the resulting improvements. For example, we also changed our admissions procedures this past year. It is possible that we have attracted a different type of student as a result.

This was the first year I included anatomy questions in the MC exam so there is no data available for comparisons to the current performance. Students in the class of 2005 will get bi-weekly anatomy lectures by an anatomist. We will be able to compare students' success on the anatomy questions with last year's students to see if having true anatomy lectures made a difference. Despite the inclusion of some anatomy this year, feedback from students and clinical instructors (CIs) continued to indicate weakness in anatomy knowledge. This was inline with the students' performance on the anatomy questions of the MC exam. It will be interesting to see what the CIs and students have to say about the anatomy knowledge of the class of 2005, and how that class will do on the anatomy exam questions.

Students indicated on the 1B-2 course evaluation that they highly appreciated the more structured practical inquiry seminars, and they continued to have difficulty with the perceived inconsistency of materials studied between the different small groups. Based on personal, verbal, conversation with several students, (students complete the official written case evaluations before they take any of the exams to avoid biasing feedback based on exam results) attempts to make the exam congruent with the course content were successful. This might indicate that students are indeed achieving the learning objectives. Students indicated the 1B-2 case exam was difficult, but fair. Some even went so far as to accept responsibility for not having studied enough in preparation for the case exam. Quite an accomplishment in the current day, consumer driven, "entitlement" educational environment!

When we surveyed our graduates regarding the areas they felt least prepared for the NPTE licensing exam, they never identified orthopedic topics. The 1B semester cases are orthopedic cases. It would be nice to think that my 1B case colleagues and I are doing such a good job with our cases that our students feel adequately prepared. Of course, I can't make that claim without further research. There are a myriad of other factors that determines a student's ultimate success or failure on a licensing exam. Some factors that we would need to consider is the amount of time in the curriculum devoted to, and the students' interests and affinity for orthopedics as compared to cardio-pulmonary, amputations, pediatrics and other areas students have indicated not feeling well prepared.

When students return from their final clinical assessment; we conduct focus groups for students as well as CIs to collect outcomes data. According to clinical instructors that supervised PBL and more traditionally trained PT students, our students demonstrated better clinical skills than their non-PBL peers. They did better in problem-solving and "thinking on their feet;" they worked better in teams and overall compared favorably with non-PBL trained students in the clinic environment. Our students indicated, almost without exception, and after overcoming the initial shock of adjustment to PBL, they enjoyed the PBL approach in spite of the frustrations of ambiguity and perceived inconsistency of content learned. Though Kaufmann et al, found no significant difference in clinical performance when comparing students in traditional and PBL curricula; our results generally concur with current research about PBL.

Part IV: Reflective Summary of the Course

In this portfolio, I showed that PBL has some clearly identified advantages over LBL. These advantages include enhancing a student's ability for hypothetico-deductive reasoning (a process that uses "backward thinking to prove a hypothesis true or false), critical thinking, working in a team, and lifelong learning, as well as providing motivation to students for learning, and increased enjoyment of the educational

experience. The PT students at NSU have demonstrated enhanced critical thinking as well as clinical reasoning skills, and work better in team format than their non-PBL peers.

Based on student feedback and the students' own perception of their learning, feedback from clinical instructors and faculty members, students' results on the written and practical exams, a better understanding of the PBL approach, and on administrative mandates; the delivery format for this case has changed since its inception in 1995. I had never been exposed to the PBL method of teaching, and though I read the necessary articles and books and felt intuitively that PBL is the right way to reach our program outcomes, I learned by doing, and adjusted as I evolved in my skills as a facilitator. My educational philosophy reflects my belief that students learn best when they have a need to learn. That need is created when using a PBL format, which is the format used for delivery of the 1B-2 case. Based on my experiences, my educational philosophy and beliefs, and on research evidence available about PBL, I will continue to use PBL principles in all my classroom educational activities.

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