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LEARNING FAILURE AND THE IMPORTANCE OF SUBJECT MATTER EXPERTS

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For many instructional designers (ID), subject matter experts (SMEs) are viewed as a necessary evil. Depending upon their day job, SMEs can be challenging to work with due to their schedules and responsibilities outside the ID's project. They can be unaware of the eLearning process, learning models and theories, and expensive – a SME can easily add thousands of dollars to an already stretched budget. However, if the ID does not have the "expert" knowledge of the content for students to achieve the learning outcomes successfully, it is improbable that the learning event will be meaningful. This paper explores students' learning outcomes in a case-based simulated learning event before and after the inclusion of a SME on an instructional design team.

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INTRODUCTION

Students in American medical schools must go through a rigorous and lengthy training program. After completing a four-year bachelor's degree, the traditional education of medical students takes four years with an additional residency program in their chosen specialty which can take anywhere from three to seven years (Mowery, 2015). The training of medical students requires the instructors to utilize behavioral, cognitive, and constructive learning processes (Hmelo-Silver, 2004; Williams & Klamen, 2006; Zimmerman, 1989). Medical schools must adequately prepare learners to enter the workforce as a physician at the end of their medical education. In addition to the curricular requirements of the hard sciences, medical schools also bear an ethical responsibility to teach students the soft sciences, including professionalism, ethics, and empathy (Giubilini et al., 2016; Langendyk et al., 2016; Patel et al., 2019).

We have been tasked with teaching the third-year medical students motivational interviewing during their required Family Medicine Clerkship (FMC) four-week rotation. At its heart, motivational interviewing is a counseling style to help elicit behavioral change "…in which the counselor uses empathic listening initially to understand the client's [or patient's] perspective and minimize resistance" (Rollnick & Allison, 2004) to change. This is achieved by the clinician understanding that motivation to change must come from within the patient; it cannot be willfully imposed upon the patient and the clinician-patient relationship should be free from conflict (Rollnick & Allison, 2004).

BARRIERS TO DELIVERY

A major barrier for the students is that the FMC is an entirely decentralized learning experience. While the other departments within the medical school regularly meet with the students during their clerkships, the students rotating through the FMC are sent to community family medicine physicians throughout the state for the entire four weeks. As such, our FMC students must complete their curricular requirements in an asynchronous online environment. This is a unique barrier in that medical students are expected to have a mastery

level skill with specific communication techniques of motivational interviewing. Another barrier is the size of the school itself. We are home to the largest allopathic medical school in North America, with approximately 370 students each year (Powell & Kowarski, 2021).

Before the COVID-19 pandemic shutdown, undergraduate medical education was still heavily steeped in lecture-based didactics and face-to-face clinical experiences (Zinski et al., 2017). In searching the literature prior to 2020, there was a notable gap in the lack of instructional design processes that utilize online technological methods of delivery in medical student education. Despite the convenience and flexibility of online learning environments, widespread use of online design principles was still lacking in undergraduate medical education curriculum development (Greenhalgh, 2001). While the technology exists, many medical schools were slow to utilize technology-based learning methodologies.

SOLUTION: THE VIRTUAL PATIENT EXPERIENCE (VPE)

Developing the Online Module

We first developed an online learning module to teach introductory motivational interviewing (MI). The design team included the first and second authors acting as the instructional designer and a "subject matter expert" (SME) respectively. As a physician who utilized MI with patients, the second author believed themselves to be a competent SME. The ADDIE (analyze, design, develop, implement, and evaluate) design model (see Figure 1) was utilized to develop the module. Part of the module included a pre- and post-assessment to gauge student learning outcomes and confidence using MI techniques with their patients.

There was also an open-ended question on the post-assessment, which asked the students to tell us what we could do to improve the module. At the end of the academic year, we reviewed learner outcomes and feedback. Overall, the module itself was well-liked by the students, and the outcomes were favorable, but most students wanted to practice their newly learned skills. While students need to practice newly acquired skills, there were some issues with allowing students to practice on actual patients. The most significant barrier is the very nature of the patient population – there is no control over who the patient will be and why the patient needs to be seen. It is quite possible that a student could go through the entire rotation and never engage with a patient needing this sort of counseling. The second barrier is that students have only learned the basics of motivational interviewing. Without fully understanding how to use this counseling strategy, the student could potentially damage the patient and/or the patient-physician relationship.

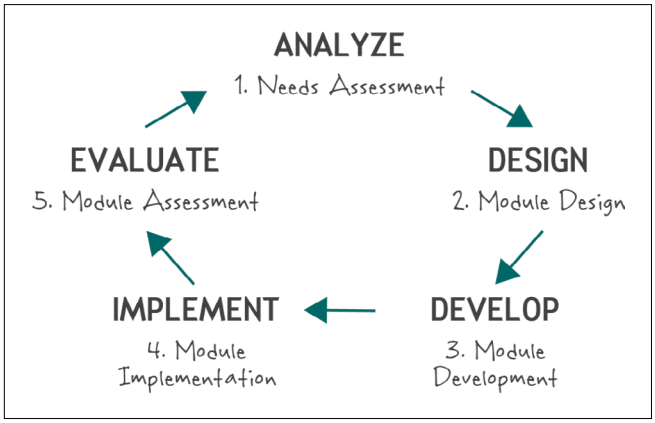

FIGURE 1. The ADDIE model.

The key feature of effective learning is to ensure that the interaction is meaningful to the learner. Mayer's Theory of Multimedia Learning suggests people learn more and at a higher level from words and images than just words alone, particularly in medical education (Mayer, 2010). This experience can be created by utilizing the different sensory modalities of the learners – through the integration of text, images, and sound. It is this multimedia experience that allows for active participation in the learning experience, which in turn produces a more meaningful learning experience (Moreno & Mayer, 2000). Based on students' feedback, we made minor changes to the module and decided to develop an online "choose your own adventure" case-based practice scenario we dubbed the "virtual patient experience."

Creating the VPE

Armed with a 30-day free demo of Articulate Storyline (Storyline) and video tutorials, we created our first "virtual patient experience" (VPE). To begin, we needed to decide upon a topic for the patient encounter. Smoking cessation is the go-to topic for MI, so we decided to do something different. Our patient would be a middle-aged woman at the doctor's office due to insomnia. She wants a prescription sleep-aid. However, it is noted in her patient history that she recently gained quite a bit of weight, thus, prescription sleep-aids could potentially be contraindicated. The student is guided to understand that the patient's obesity could be the cause of her sleeplessness. Based on this working patient encounter, we again filled the role of SME and worked together to write the script.

We played the roles of basically ourselves – a physician asking the questions and the patient providing the responses. We provided two choices for the student: one correct question and an incorrect one. Based on the choice by the student, the "patient" responds appropriately. At this point, we developed a rudimentary storyboard (see Figure 2) for the project development based on the script. Design decisions were made as the VPE was being built.

We hired an actor to play the role of the patient (a standardized patient), and off-camera, we asked questions. This

FIGURE 2. VPE rudimentary storyboard (3"x5" notecards taped to wall).

created more of a dialogue. We video-recorded the standardized patient's responses. We edited the videos, and at this point, we created the VPE and embedded the Storyline module within the learning management system (LMS). The VPE was rolled out at the start of the academic year as a formative, non-graded practice activity after students completed the MI learning module (see Figure 3). The VPE ended one of two ways: either the encounter was successful, and the patient understood their weight gain was causing insomnia, or the patient became very upset and walked out of the appointment.

Evaluating the VPE, Version 1.0

To effectively evaluate the VPE, we administered pre- and post-assessments. The assessments included questions about motivational interviewing knowledge and student confidence in using MI tools with patients. On the post-assessment, we also included three five-point Likert (strongly disagree, disagree, undecided, agree, strongly agree) questions specific to the VPE such as:

FIGURE 3. Screen shot of the first VPE.

- The VPE was presented in an interactive way
- The VPE was helpful in applying newly acquired MI techniques
- I would like to see more VPE's like this one

Additionally, an open-ended question asked, "What can we do to improve this VPE?"

Learner Feedback

Before we begin this discussion, one note of importance is to share how confident we were in the success of our VPE and how we generally felt like first-level rock stars. There are no words to adequately convey how awesome we thought we were with the development of this VPE.

The students liked the VPE. While 93% strongly agreed/agreed it was presented interestingly and interactively, 85% strongly agreed/agreed the VPE was helpful in applying MI techniques. While 79% strongly agreed/agreed that they would like to see more VPE's like this one, 19% were undecided. As we completed this data analysis, we thought surely the students were being unnecessarily fickle. After all, this was an amazing tool! The learner-specific feedback helped us understand the issues with the VPE. While a few students did state they would like to practice on an actual patient, nearly every student stated one or more of the following: (a) make more places for the student to make selections instead of reading, (b) make the incorrect answer less obvious and more realistic, and (c) make it more challenging.

Reading through the students' honest feedback made us realize that our VPE needed more than revisions…it needed to be completely re-done. More importantly, we realized we needed an actual SME to make this project a success. Learner feedback included comments such as, "this has obvious answers, and it doesn't really help us learn how to talk to people or affect future communications with patients," "I really did like the choose your own adventure style, but

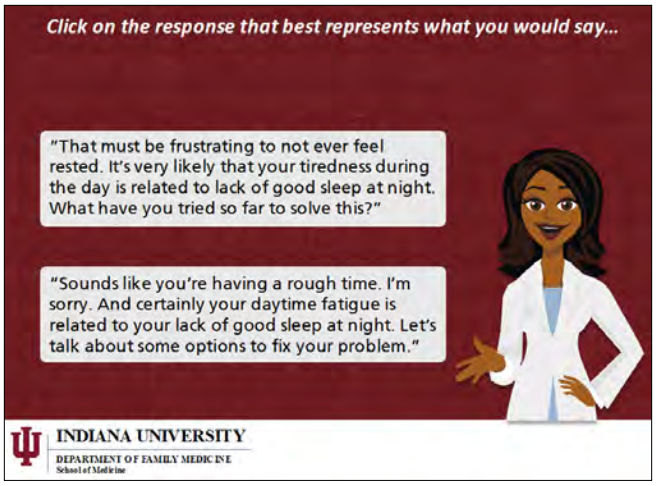

FIGURE 4. Example of VPE 2.0 slide.

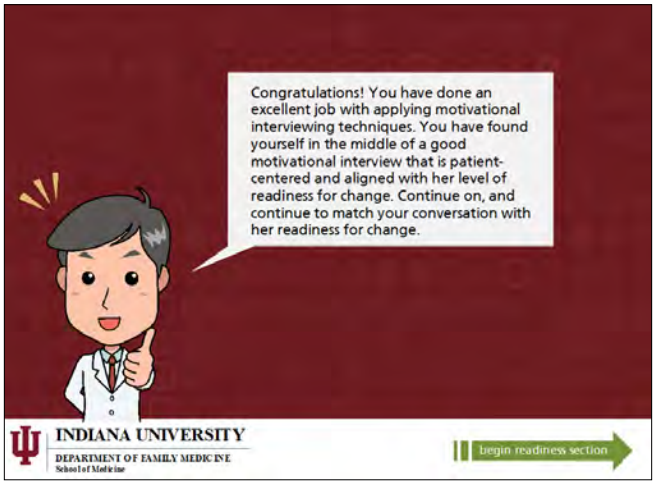

FIGURE 5. Successful Patient Encounter Feedback.

FIGURE 6. Unsuccessful Patient Encounter Feedback.

sometimes the choices seemed contrived. Sometimes I really didn't like either choice and would have picked something more open-ended to say or ask in real life", and "I really did not like that there were right and wrong answers when I would not have chosen either of the 2 options given to me, I think motivational interviewing is to be open rather than to be right or wrong like that". While our egos took a major blow, with this feedback from the students, we knew we had to make some serious changes to improve learner outcomes.

VIRTUAL PATIENT EXPERIENCE: VERSION 2.0

Our first change was to enlist someone with expertise in motivational interviewing techniques. For many instructional designers, SMEs are viewed as a necessary evil. Depending upon their day job, SMEs can be challenging to work with due to their schedules and responsibilities outside the ID's project. They can be unaware of the eLearning process and/or learning models and theories, and expensive – a SME can easily add thousands of dollars to an already stretched budget. However, if the ID does not have the "expert" knowledge of the content for students to achieve the learning outcomes successfully, it is improbable that the learning event will be meaningful.

We are fortunate to work in many disciplines within our department; thus, our search for a SME in motivational interviewing was easy. We had a behavioral psychologist as part of our department's faculty. Part of his responsibilities was teaching motivational interviewing to residency-level learners. The challenge was, securing his time for the project as he was not a part of our division. Fortunately, because we started our analysis of VPE version 1.0 before the end of the academic year, we allowed ourselves over four months to create VPE version 2.0. We also had enough time to apply for a university "curriculum enhancement grant" (CEG) to help fund this project and his time to secure the SME (we were awarded the grant).

Developing the New VPE, Version 2.0

After the details were worked out and our SME was a part of this project, our first meeting was to discuss what we needed from him and demo VPE 1.0. According to the SME, the key to creating a successful VPE was in the presentation of choices the students make during their VPE patient encounter. In our original VPE, we created choices that were either right or wrong, with the VPE ending well or the patient getting frustrated and leaving. The SME's presentation of choices would be "good" or "better" (see Figure 4).

Additionally, his vision of the VPE was to end one of five ways, essentially equating with a grade of A, B, C, D, or F (although, in the end, it was not presented to the students with this grading scale). Another key learning tool implemented by the SME was the use of hints. Once the students reached the end of the VPE, they received feedback specific to their choices. If the student received an A or B, they were given appropriate feedback and allowed to move to the second VPE. If, however, the student received a C, D, or F, they were

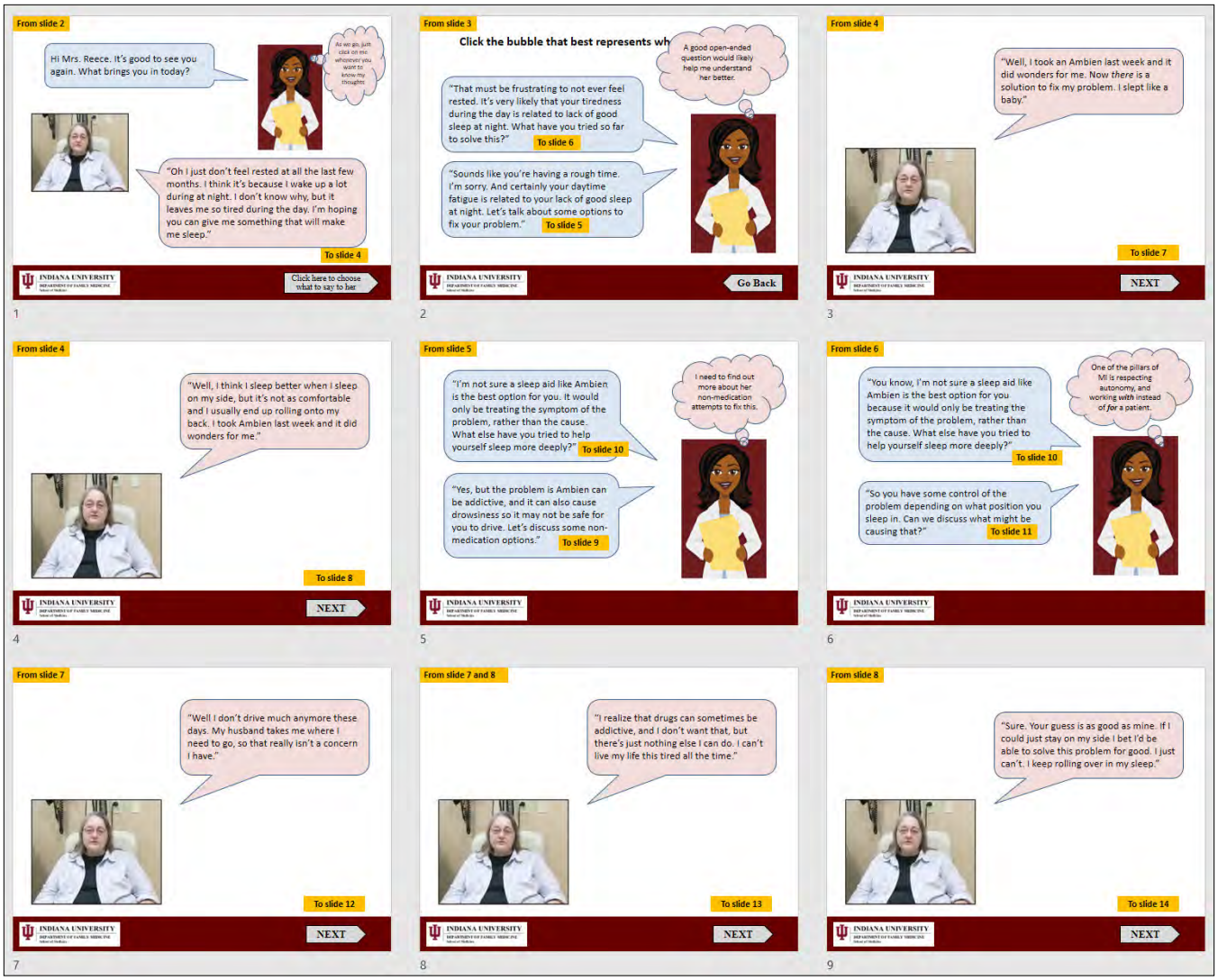

FIGURE 7. VPE storyboard (Microsoft Powerpoint).

given appropriate feedback and asked to review the module and redo the VPE (see Figures 5 and 6, next page).

Additionally, they were also instructed that if they get "stuck", they can click on the physician, and a "hint" will appear (see Figure 7). The SME's first task was to rewrite the patient encounter script. We kept the scenario from VPE 1.0 for two reasons: (1) students liked that it was an interesting encounter and, (2) it would enable us to compare VPE 1.0 and 2.0 more accurately. After the SME developed the new script and storyboard (see Figure 7), we followed the same protocol for VPE development as was completed in version 1.0.

Once the VPE was developed using our purchased license of Articulate Storyline (Storyline) and embedded within the LMS, another important addition to the development of VPE 2.0 was the incorporation of beta testers into the project. Students who had completed VPE 1.0 were invited to do VPE 2.0 and provide feedback. This feedback was incorporated, and the final project was ready for dissemination into the next academic year.

Learner Feedback

VPE 2.0 was a measured success. Ninety-six percent of students strongly agreed/agreed it was presented interestingly and interactively, and 87% strongly agreed/agreed the VPE was helpful in applying MI techniques. The greatest gains were with if students would like to see more VPEs like this one. Ninety-seven percent of students strongly agreed/agreed that they would like to see more VPEs like this one. Learner comments also suggested that this type of activity be utilized in other areas of their medical education (e.g., taking a history). We used a paired samples t-test and confirmed that the change in content knowledge from pre- to post-assessment was statistically significant at the $p<0.001$ level

Additionally, participants' ability to correctly identify MI techniques increased from pre- 50% to post-assessment 72%. The

data from the content knowledge, student satisfaction, and confidence measures combined with the positive ratings of instructional strategy use strongly suggest that using a VPE within the medical student curriculum could be extremely beneficial. Learner feedback included comments such as, "This type of module was very good. I liked it better than I thought I would. More of these, please! Different scenarios and different patients", "Overall, it was a very good experience. I could tell how very broad but prodding questions could make small changes in the conversation for the benefit of learning more of the patient", and "I thought the virtual patient experience was helpful".

OUR REFLECTION OF OUR DESIGN AND ITS FAILURE

The greatest lesson learned was, that no matter how much you think you may know about a topic, the addition of a SME to the instructional design team is invaluable. While not all projects are afforded the luxury of time, allowing as much time as possible to properly incorporate the ID team members and develop the learning event will increase learner outcomes, and ultimately your success. Another important lesson was the use of a properly developed storyboard. We took shortcuts, thinking it would not matter. It mattered. In the end, we had to accept the responsibility that we were responsible for the failure, time, and monetary investment that came with the development of VPE 1.0. We were quite fortunate to be awarded a grant to cover the costs of the VPE 2.0.

The hardest lesson learned was to put away our egos. Our initial reaction to the student evaluations was to dismiss what the data was telling us. However, after stepping back and looking at the evaluations objectively, we had no choice but to start the entire project over. Our pride did not matter; what mattered was that the students learned what we were trying to teach. The students are a part of the ID team as well.

Moving forward from this design failure experience, we have incorporated the use of SMEs with every module development. Our greatest takeaway is not only to utilize SMEs but also to effectively use SMEs by building enough time in the design process. For example, this past academic year, we decided to incorporate "professional development" modules for students to learn about some of the sub-specialties found within family medicine. We developed seven new modules, which required seven SMEs who are experts in the topics. For our design process, we worked closely with the SMEs and communication was the key to our success, and we added four weeks to design the process for the SMEs.

While we have had successful interactions and end-user results with incorporating SMEs in our design process, that is not to say that SMEs would be a prudent addition to every situation. As stated earlier, we are very fortunate to work with various individuals who possess many of the skills needed. We have easy access, we all know each other as we are colleagues, and overall, our department strives to make everyone successful.

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REFERENCES

Giubilini, A., Milnes, S., & Savulescu, J. (2016). The medical ethics curriculum in medical schools: Present and future. *The Journal of Clinical Ethics, 27*(20), 129-45. https://doi.org/10.1086/JCE2016272129

Greenhalgh, T. (2001). Computer assisted learning in undergraduate medical education. *British Medical Journal, 322*, 40-44. https://doi.org/10.1136/bmj.322.7277.40

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review, 16*(3), 235-266. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3

Langendyk, V., Mason, G., & Wang, S. (2016). How do medical educators design a curriculum that facilitates student learning about professionalism? *International Journal of Medical Education, 7*, 32-43. https://doi.org/10.5116/ijme.5683.c2e0

Mayer, R. E. (2010). Applying the science of learning to medical education. *Medical Education, 44*, 543-549. https://doi.org/10.1111/j.1365-2923.2010.03624.x

Moreno, R. & Mayer, R. E. (2000). A coherence effect in multimedia learning: The case for minimizing irrelevant sounds in the design of multimedia instructional messages. *Journal of Educational Psychology, 97*, 117-125. https://doi.org/10.1037/0022-0663.92.1.117

Mowery, Y. M. (2015). A primer on medical education in the United States through the lens of a current resident physician. *Journal of Thoracic Disease and Annals of Translational Medicine, 3*(18), 270-279. https://doi.org/10.3978/j.issn.2305-5839.2015.10.19

Patel, S., Pelletier-Bui, A., Smith, S., Roberts, M. B., Kilgannon, H., Trzeciak, S., & Roberts, B. W. (2019). Curricula for empathy and compassion training in medical education: A systematic review. *PLoS ONE, 14*(8), 1-25. https://doi.org/10.1371/journal.pone.0221412

Powell, F. & Kowarski, I. (2021, August 25). 10 medical schools with the most students. *U.S. News & World Report*. https://www.usnews.com/education/best-graduate-schools/top-medical-schools/slideshows/10-medical-schools-with-the-most-students?slide=13.

Rollnick, S. & Allison, J. (2004). Motivational interviewing. In N. Heather and T. Stockwell (Eds.), *The essential handbook of treatment and prevention of alcohol problems* (pp. 105-115). John Wiley & Sons Ltd.

Williams, R. G. & Klamen, D. L. (2006). See one, do one, teach one: Exploring the core teaching beliefs of medical school faculty. *Medical Teacher, 28*(5), 418-424. https://doi.org/10.1080/01421590600627672

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology, 81*(3), 329-339. https://doi.org/10.1037/0022-0663.81.3.329

Zinski, A., Blackwell, K., Belue, F. M., & Brooks, W. S. (2017). Is lecture dead? A preliminary study of medical students' evaluation of teaching methods in the preclinical curriculum. *International Journal of Medical Education, 8*, 326-333. https://doi.org/10.5116/ijme.59b9.5f40