Review of *Higher Education 4.0: The Digital Transformation of Classroom Lectures to Blended Learning*

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Blended learning, as a diverse and expanding area of inquiry, combines face-to-face and online instruction as an alternative educational design. Recently, blended learning has become more common in educational contexts across the globe and is likely to come forth as a predominant model in the future and most probably replace online or face-to-face instruction alone (Martin-Garcia, 2020; Vo et al., 2017). There have been a number of emerging trends related to scholarship in blended learning, and many researchers are investigating its transformative potential in education. While scholars such as Martin-Garcia (2020) and Keengwe and Agamba (2015) analyze the quality of blended learning training environments and present various contributions that describe the most relevant theoretical models on the instructional design of blended learning, Jones and Sharma (2021) set out to conduct a longitudinal study on the transition from traditional instructional design to blended learning and provide a comprehensive account of the impact of this transition on students' academic performance and teacher and students perspectives during the course of this transition.

One of the merits of this book compared to other studies on blended learning (Keengwe & Agamba, 2015; Vo *et al.*, 2017; and Martín-García, 2020) is that it provides empirically based evidence of a case study on the impact of blended learning in a real-life educational setting, similar to sources such as Bersin (2004) who provides examples from twenty case studies and generalizable lessons learned for all educational settings. The book is a monograph comprised of seven chapters that describe the longitudinal research project conducted over seven years, reporting the objectives, scope, methodology and findings of the project. The study was initiated in order to investigate changes in the academic performance of software engineering students in an Asian university context after shifting the instructional design from traditional lecturing to blended learning. In this duration, the first year was intended for measuring students' academic performance while studying the course, followed by a shift to blended learning instruction and observation of changes in students learning and performance. The research methodology is Action Design Research (ADR), adhering to Unified Modelling Language (UML) for the design of the blended learning research platform, which follows Gagne's (2015) "nine

steps of instruction" and Chickering and Gamson's (1987) "seven principles of good practice."

The first chapter gives an overview of the research setting, research question, survey of existing knowledge, research and experiment design, operation of the research platform, transformation and analysis of the data, and findings. The study is the outcome of a postgraduate doctoral thesis addressing the impact of changes in instructional design on the academic performance of students. The research question put forth is "*what effect will a change of instructional design, from traditional lecturing to blended learning, have on the academic performance of students enrolled in the course?*"

The second chapter is a survey of existing knowledge in learning and teaching related to this study. Five functional classes include essential formal learning theories, theory of instruction, choices of instructional designs, learning strategy for this study, and blended learning. While the dominant underlying theories of development referred to are Piaget's developmental stage theory and Vygotsky's zone of proximal development, it is proposed that people's development through learning could possibly fall between these two poles because formal learning brings with it certain issues that may not conform to these theories. It is ultimately the teachers' duty to stimulate receptivity in the student and evoke the student to "learn how to learn." This chapter presents a comprehensive account of learning theories and instructional design and is a must-read to clearly understand how instructional designs are aggregated into blended learning. Even though the focus of the study is engineering students' learning styles, the content is generalizable to other fields as well.

Chapter three provides a thorough account of the empirical methodology of the study, which is the new instructional design, blended learning, sequenced with learning activities, educational technology, course content, and assessment instruments, including detailed tables of the weekly learning activities and related instructional designs. This is followed by Chapter four which details an adopted version of Prosser and Trigwell's (1999) model of learning and teaching in higher education (from "Understanding Learning and Teaching, the Experience in Higher Education" (Prosser & Trigwell, 1999) (as cited in Jones & Sharma, 2021). Development of the data model based on the learning model is elaborated in Chapter five, while Chapter six gives the exploratory statistical analysis and discussion. The final chapter rationalizes the results as conclusions and implications for higher education performance in blended learning design.

The significance of this research was that the teacher and researcher were the same for the entire 11 semesters of the experiment, which played an essential factor in normalizing the Hawthorne effect. Having teaching done by the same person with a unified purpose created a sense of consistency throughout the duration of the research; however, it was very daunting on the teacher's part due to the workload because it included both instructional designer and implementer roles. This point resonated well with me because of my experience conducting a research study on implementing technology in the classroom, playing the role of both teacher and researcher, so I can understand what a strenuous task it was for the author to design, implement and assess the students' performance single-handedly.

In a meta-analysis conducted by Vo *et al*. (2017), it was also confirmed that blended learning is significantly linked with higher learning performance of STEM-disciplined students compared to traditional classroom practice, which is in line with the findings of the study done by Jones and Sharma (2021). Contrary to this study, Vo et al. (2017) have gone forth to evaluate the moderating effects of subject matter (STEM vs. non-STEM) and course level (undergraduate vs. graduate) on student learning. One aspect that could be considered for future studies similar to Jones and Sharma (2021) is to incorporate a comparison of blended learning in the hard and soft sciences. While the current study focuses on the transition to blended learning only in a single STEM discipline, software engineering, a non-STEM discipline could also be investigated simultaneously to make observations of teaching methodology and learning outcomes of blended learning in this context.

One of the strengths of this study is that the authors take into account end-of-course evaluation as a specific element of instructional design to show the impact of this transition thoroughly and make exact observations of student learning. This is also observed in many studies, including those found

in Vo *et al*. (2017); Keengwe and Agamba, (2015); and Martín-García, (2020). However, a note to consider is that course elements need to be further elaborated, that is, to what extent does blended learning mode necessitate extra learning time, instructional resources and other course elements that encourage interaction among learners. Elaboration of these elements is of significance because the results of this study can be more reliable due to the fact that the study is longitudinal and conducted over a seven-year duration.

While the authors do provide a comprehensive account of learning models and methodology of transforming their instructional design, if they were considering a reprint, one change could be to give accounts of transitions to blended learning in different contexts and compare the learning outcomes with this study to imply the significance of the results, both for subject matter, context, and course level. A future edition might give a review of similar studies in different countries in order to evaluate influencing factors on the success rate of implementing blended learning in higher education.

Generally, this volume adds to our understanding of a real-time transformation to blended learning in higher education by depicting its impact on students learning during a seven-year study. This volume is highly recommended to teachers and educators who would like to gain insight into the process of transforming their teaching from traditional to blended instruction, not only in the field of software engineering but also in other SEM disciplines. The comprehensive account of learning models and underlying instructional design provided in chapter two raises the readers' awareness and provides abundant information to get a better grasp of the topic. By skillfully establishing the underlying constructs of blended learning at the onset, the author paves the way for a better understanding of the transition in the following chapters and hence facilitates overall comprehension. Furthermore, what makes this a worthwhile read is that the ideas, findings, and viewpoints shared in this book are gathered from years of reflection and introspection of the authors, dating back to their teaching experiences since 2002 when they were probing into improving the learning/teaching process of their classes. In this way, the author's experience as teachers shaped their venture to implement a new instructional design that had never been implemented in this university, thus creating a rich learning experience that would, later on, transform the students learning styles in their future endeavors. I will have to totally side with the authors when they state that *"research cannot be envisioned as being an entity independent of the learning and teaching, and the propositions of the learning and teaching can be understood through the suppositions of the research"* (Jones & Sharma, 2021).

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