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Re. Final report for paper presented at the International Conference on Research in Education and Science (ICRES 2017), May 18-21, 2017 in Ephesus Kusadasi, Turkey.

A. Research paper entitled: *“The Effect of Utilizing Project-Based Instruction on Students’ Metacognition and Self-efficacy in Face-to-Face, Hybrid and Online Learning Environment”*.

B. Research problem:

Project-based learning is a teaching strategy that focuses on student-directed investigation (Blumenfeld et al., 1991; English & Kitsantas, 2013). Through this strategy, students engage in projects by articulating questions for investigation, designing plans, collecting and analyzing information, and creating a product of their understanding (Blumenfeld et al., 1991). Through students’ enquiry and experience with the project under study, they are expected to identify information needed, locate resources and then integrate the collected resources into coherent projects. The core focus of PBL learning setting is allowing students to organize their learning around the investigation, explanation, and resolution of meaningful problems. Consequently, by allowing students to become responsible for their own learning, they engage in reflective and critical thinking about what is being learned (Barrows, 2000; Bereiter & Scardamalia, 1989; Torp & Sage, 1998). Therefore, project-based learning is considered as an important learning approach that may support students’ self-regulated learning through setting goals, selecting learning tasks and strategies, and monitoring progress toward goals (Blumenfeld et al., 1991; English & Kitsantas, 2013; Sungur & Tekkaya, 2006).

In the light of prior research, the purpose of this study is to examine the effect of project-based learning (PBL) on pre-service teachers’ self-regulation and self-efficacy skills in face-to-face, hybrid and online learning environment: Research questions guiding this study include: Is PBL an effective teaching strategy for improving pre-service’ self-regulation skills? Does PBL effect pre-service’ self-regulation differently in face-to-face, hybrid and online learning environment? Is PBL an effective teaching strategy for improving pre-service’ self-efficacy to integrate technology in teaching? Does PBL effect pre-service’ self-efficacy differently in face-to-face, hybrid and online learning environment? And does PBL effect pre-service differently based on their learning style preferences?

C. Research procedure

At the beginning of the course, all students completed a demographic survey, and a pre-self-efficacy survey. Next, instructors used the project-based method to teach several topics in 14 consecutive weeks. At the end of each week students created projects related to the week's topic and at the end of the 15th week, students completed another self-efficacy survey (post). All surveys and learning activities were presented and submitted through Blackboard.

D. Summary of findings

The results revealed that the use of the project-based teaching strategy does improve pre-service teachers' self-regulation skills in a technology integration course. Furthermore, the results showed that students' self-efficacy perception was significantly improved after engaging in PBL strategy and that pre-service teachers' self-regulated skills improved equally in three different learning environments: face-to-face, hybrid and online. Finally, the results showed that the PBL activities improves pre-service teachers self-regulated skills, regardless to their learning preferences, either they prefer to use lectures/discussions, books/written material, video/movies/media, or hands-on activities.

E. Conclusions and recommendations

The present study adopted project-based teaching strategy to help pre-service teachers integrate and apply technology in teaching. The main finding of this study is that the use of the project-based teaching strategy does improve pre-service teachers' self-regulation skills in a technology integration course. This benefit demonstrated by the statistically significant differences in pre-service teachers after engaged in PBL strategy and reported higher self-regulation and self-efficacy scores in all learning environments (face-to-face, hybrid and online). Furthermore, the results suggest that students engaged in the PBL viewed their learning activities as more personal curiosity to discover new tools to use in teaching and offered them internal motivation. According to Blumenfeld (1991), students are more likely to take part in technology project-based learning when projects focus on questions that they perceive as valuable, are challenging, include a variety of activities, are realistic and result in authentic products. Furthermore, as students generate learning goals or problems, they seek new information when they find themselves unable to proceed without deepening understanding of what is already known Therefore, PBL environment offers students the opportunity to identifying and generating a "need to know" and leading to meaningful integration of information (Moore, 1995).

Another significant finding of this study is that students' self-efficacy perception was significantly improved after engaging in PBL strategy. This benefit demonstrated by the statistically significant differences in the reported self-efficacy scores after the project-based activities. A possible interpretation for this result is that the project-based activities promote students' cognitive engagement and help them to interact more efficiently with learning content and consequently improved and promoted their self-efficacy perception. This interpretation is consistent with prior self-efficacy research. According to Bandura (2006), self-efficacy reflects what individuals believe they can do with the skills they possess and they can accomplish.

Additionally, the findings of this study revealed that the PBL activities does improve pre-service teachers' self-regulated skills equally in a technology integration course in three different learning environments: face-to-face, hybrid and online. These results suggest that regardless of learning environment, students will improve their self-regulated skills when they engage in the PBL activities.

Finally, the results showed that the PBL activities improves pre-service teachers self-regulated skills, regardless to their learning preferences, either they prefer to use lectures/discussions, books/written material, video/movies/media, or hands-on activities.