

氏名	HUSSEIN ZANATY MOHAMED YOUSSEF		
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論文審査委員	主査	教授	榮坂俊雄
		教授	三浦則明
		准教授	鈴木育男
		教授	升井洋志
		教授	柴野純一

学位論文内容の要旨

Introduction: One of the goals of the ICT is to overcome the limitations of the education and sustainable learning environments. ICT provided innovative solutions and models for better learning environment in urban societies. However the benefits of ICT models are not fully applied in enhancing local education for sustainable development. At the local education institutions, the conventional learning style based on teacher-center approach is not adequate for effective learning development. Thus, the needs for new approaches, which must aim to improve students' academic achievement, logical thinking ability, creativity, critical thinking, and peer educator approach, is challengeable.

Through the literature views, the learning cycle phases developed an effective teaching approach and intellectual development and improved students' problem solving. In this reason, the adoption of ICT-enhanced learning cycle model in an educational design study is an essential aspect not only to provide educational solution in education, but also to reduce the gap between the urbanized and rural students' educational resources.

Purpose and significance: The purpose of this study was to investigate the effectiveness of adopting the sustainable learning cycle model-enhanced peer educator approach in a meaningful learning environment. For students, the peer-educator approach based on this model would allow them to get benefits of adapting technology tools, creatively to think critically and solve problems related to leaning environment through a real-world experimental process.

Design: The study introduced a new learning cycle model of intellectual development in three phases including: (1) Form, (2) Inform, and (3) Reform (FIR). The FIR based on 6 conceptual elements (6E) including: Experience, Explore, Explicate, Elaborate, Evaluate and Extend for sustainable multiple contribution "locally and internationally". The FIR-6E process was supported with multiple assessments, qualitative and quantitative analysis.

Method: The method of this study carried out with well-organized design research guideline and action plan in order to conduct effective outcomes. The guideline was organized in six interactive processes including: (1) Implementing the FIR-6E design in the way to investigate how the design fit the problem-solving, (2) Modifying the FIR-6E design in the way to improve the design operations and transitions between phases, (3) Using multiple ways of analysis in the way to maintain the interaction within the groups

and teacher-to-student through the process, (4) Measuring dependent variables in the way to measure how sustainable the FIR-6E design is and how to effectively implement both qualitative evaluation “pre-test, post-test and questionnaire” and quantitative evaluation “observation, self-achievement card, self-scenario process and self-regulation interaction”, (5) Measuring independent variables in the way to evaluate how the FIR-6E design fit the learner styles through flexible roles with groups interaction, and (6) Reporting on design research in the way to document the inputs, outputs and outcomes of each phases and reflection in order to extend the activities in large-scale approaches. Action research was conducted over two semesters 2013 and 2014 to transfer student’s attitudes from learner to peer-educator in a longitudinal learning environment.

For the comparison, two case studies were carried out in an elementary school in Kitami city of Japan. In the first case study, 30 random students as the control group were exposed to cross-cultural lesson based on the conventional instructional style. In the second case study, same students as an experimental group were to engage in creating DVD learning materials for international rural students in Egypt with the 6E learning cycle style under the teacher’s positive involvement.

Results: The results showed a significant difference between the experimental and control group through the analysis of the standard deviation of all three indicators of the central tendency in case study two. Clearly, the experimental group “SD 38” is higher on all three indicators than the control group “SD 16” and, therefore, performed better with the implementation of FIR-6E instructional model.

Discussion and Conclusion: According to data results, the implementation of the FIR-6E model promoted some approaches for facilitating effective, efficient, and engaging instruction. The model can be used as a process guideline to engage both teachers and students in a meaningful learning environment and community development. We hope the UNESCO can get benefits of implementation of the FIR-6E model in their training programs.

論文審査結果の要旨

近年、教育をシステムとして捉え、工学手法やArtifactsを活用して教育過程の評価・解析・支援・設計を行う教育工学が発展している。特にActive Learning, Project-Based Learningなど能動的・参加型教育方法や循環型学習モデルが多数提案されている。一方、発展途上国や辺地では予算・設備や教員の不足により、十分な人的・物的サポートを前提とした学習支援システムが有効に機能しない。本論文では学習者を、ICTを利用し教材を製作する主体的参加型教育を通じてPeer-Educatorとして育成することによりこの問題の解決を目指し、そのための新たな持続的学習サイクルモデルを提案した。

本研究の成果は国際学術誌に掲載されるとともに、NHK日本賞コンクールやユネスコ国際会議においても発表され、高い評価を受けて学長表彰を受賞している。また本研究は地元の小学校やエジプト・アラブ共和国の教育機関と連携した教育交流において実践的に検証されている。

これを要するに、申請者は新たな持続的学習モデルを構築し、これに基づいた教育過程を提案するとともに、初等教育での実践活動において、その有効性を確認しており、教育工学に貢献するところ極めて大である。

よって申請者は、北見工業大学博士（工学）の学位を授与される資格があるものと認める。