Affordances of learning engagement using ‘MUCBCS’ strategy

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Abstract. Engagement has been at the forefront of active learning. With the growing capabilities of engagement strategy and its importance for effective learning, the question emerges: how does ‘’MUCBCS’’ (music, context-based inquiry, computer simulation) contribute to affordances of learning engagement in the science classroom?
It is argued that a strategy fundamental for effective learning and application to physics is to harness the affordances of ‘’MUCBCS’’. This study investigated the impact of ‘’MUCBCS’’ on affective and cognitive engagement using semi-structured interviews, pre-tests, and post-tests with 50 science teachers. The results revealed a high Cronbach’s alpha value above 0.85 and afforded active participation.

Introduction

Research on the affordances of learning engagement using ‘MUCBCS’ (music (MU), context-based inquiry (CB), and computer simulation (CS) as a learning engagement strategy is rare. Though engagement is important for effective learning, creating engagement in the classroom is a problem for teachers. For learners to benefit in the classroom they need to “engage” in a manner that increases their learning. [1] found that a combination of technology-infused strategies promotes engagement. Hence this study focused on three combined engagement strategies ‘MUCBCS’ to investigate learning engagement within the South African context.

Affordance as the functional properties that describe an action can assist teachers to create engagement. The ‘MUCBCS’ strategy identifies the properties that describe the use and impact of MU, CB, and CS on learning engagement.

Music as a pedagogical tool for physics education provides an alternative science teaching and engagement strategy [2]. MU in this research refers to its content, creating, learning, and singing content songs. The affordances of MU increase the quality of emotion, attention, and responsive engagement. Context-based inquiry is used to conduct investigations and physical models’ representations in physics. CB bridges the gap between learning in class and everyday life resulting in affordances such as everyday experiences and problem-solving. Computer simulation was introduced as a science instrument in nuclear physics after World War II and has extended into several research disciplines. The affordances of CS allow visualizing relationships between variables that are not easy to manipulate in the physical classroom [3]. [3] argued that the affordance of CS activities allows working at higher cognitive levels. Even though CS can slow down interpersonal skills, it can be used to teach complex physics [4].

To further identify the affordances of using ‘MUCBCS,’ a framework that supports individual intelligence and creates opportunities to use different strategies was considered. For this reason, multiple intelligence and constructivist learning theories formed the theoretical framework within which the engagement strategy was investigated to answer the research question of: ‘How does ‘MUCBCS’ strategy contribute to affordances of learning engagement in the classroom’?

Methods and findings of the study

The mixed method approach by which the researcher combined the elements of quantitative and qualitative research was used for validation and verification**.** To accomplish this, a reliable questionnaire with valid constructs was compiled by the researcher. The questionnaire served

as a pre and post-test; followed by semi-structured interviews with 6 teachers. The researcher conducted a preliminary survey and literature study to identify a set of key concepts, which were used to draw up the questions. The questions were grouped into three phases to form the constructs: Phase 1 for MU, Phase 2 for CB, and Phase 3 for CS. Each phase was assessed with questions that relate to content on Periodic Table, cognitive and affective engagement. A total of 50 professional science teachers in schools within the North-West province participated. The participating teachers were engaged in 4 hours workshop on two separate Saturdays.

The questionnaire and semi-structural interview collected data on the perceptions of the effectiveness of 'MUCBCS', the affordances of the engagement strategies, and the level of engagement experienced by the teachers. The data collected from the responses was statistically analysed to determine the reliability and validity of the constructs. And produce frequency tables, compare pre-test and post-test results with the aid of Cohen's effect sizes. Interview results were transcribed, and trends were determined. Internal consistency was very good, as a result of high Cronbach's alpha value between 0.85 and 0.9 for all questions in the pre-test and post-tests. For all constructs, except context-based cognitive, the average scores were higher in the post-test than in the pre-test. This implies that the teachers' perception after the intervention changed positively.

'MUCBCS' resulted in a medium effect on the following constructs (with $0.5 \leq d \leq 0.8$): MU cognitive and CB cognitive. This implies the cognitive construct of MU showed an average difference of nearly 8% between pre and post-test scores. On the other hand, CS impacted positively with small to medium effects on affective and cognitive engagement.

MU affords concentration and active participation towards understanding and application of scientific concepts. While CB enhanced affective engagement with minor effects on cognitive engagement, affording interest and enjoyment. CS affords mastering and visualization of abstract concepts.

Conclusion

All three strategies combined in 'MUCBCS' engaged participants in affective and cognitive engagement by focusing and placing the participant at the centre of the learning environment. The Affordance of 'MUCBCS' as active participation and engagement in the classroom provided an opportunity to increase cognitive and affective engagement. The learning engagement process can be enhanced by identifying the affordances of an engagement strategy to give more insight into direct teaching and learning. In conclusion, it is recommended that teachers should use the 'MUCBCS' strategy (combined music, context-based inquiry, and computer simulation) as it has a beneficial impact on affective and cognitive engagement and affordances. Teaching could start with MU in the form of content songs, to grasp learners' attention, followed by using CB to build interest in the topic and CS to visualize abstract concepts for understanding.

References

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