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Students' Perspectives on Digital Curriculum of Science at the Secondary Level: Gender and School Location

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Abstract

The study's primary goal was to look into the "Students' Perspective about Digital Curriculum of Science at secondary level." This study was to analyze the important factors of Student Perspective about Digital Curriculum of Science at secondary level in public as well as private school, male and female students to find out the relationship between of these variables. Simple stratified sampling was used for the collection of data. All the public and private, male and female secondary schools of Muzaffargarh were selected as a population of study. Data was collected from 400 male and female class 9th and 10th students of all public and private secondary schools of Muzaffargarh. The data was collected from rural and urban school teachers and students from district Muzaffargarh and three tehsils. Researcher was adopted the questionnaire. The validation and amendment of questionnaire was based on expert opinion. The reliability of the questionnaire was assessed through Cronbach's alpha. There were two questionnaires selected for research one was for the teachers and the other was for the students. There were 20 statements in students' questionnaire. SPSS was used to examine the data. The data were analyzed and interpreted using inferential statistics (one way ANOVA and independent t-test) and descriptive analysis (mean and percentage).

1. Introduction

In many countries, there are increasing pressures for schools to adopt and take up digital materials (Choppin & Borys, 2017). Advocates argue that digital materials have potentially transformative features, such as enhanced interactivity, customization, and adaptive assessment. However, there are multiple forces informing the design, dissemination, and use of digital curricula that will influence the extent to which and the ways in which these transformative features will be incorporated into the development of digital materials, disseminated at scale, and taken up by users.

Digital media can be defined as any form of information that is stored digitally and can be accessed through multiple sources including subscriptions, free online resources, and other digital devices. It includes text, graphics, audio, video, internet applications, and other technologies that can be used to create and deliver digital curricula (Tatnall et al., 2011). Students can use additional digital media that are collected into a system to access and share learning materials.

Menon (2015) stated that the days when learning used to be uninteresting with a teacher teaching using a boring chalkboard. Who knows learning could be fun and entertaining with the changes in the teaching system. With the advent of the Smart Class learning has become more enjoyable in class. In sim ple terms, innovative and meaningful use of technology in the way of

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teaching has enriched learning because it engages the students and the teachers and creates a connection between them by making the class active. Everyone likes to watch videos and movies, especially the kids. Students are shown video clips related to an undertaken concept with the help of the technology in digital classrooms, the teaching sessions can also be recorded for further use by uploading the recorded documents on the web.

Based on the above, technology readiness can be defined as a concept that describes people's tendency to use technologies for achieving goals. Readiness has to do with teachers' awareness, knowledge of use, perceptions, and attitudes toward their capabilities and skills for technology integration as well as gaining experience in the use of educational technology (Msila, 2015). Researchers have identified two components of technological readiness: technical and pedagogical readiness. These factors are considered crucial for the success of any technological innovation in teaching and learning. A comparative study of pedagogy and ICT use in schools in 22 different countries concluded that teachers' pedagogical and technical competence in the use of technology are significant predictors of technology adoption in teaching practice (Law & Chow, 2008). These two components have been examined through the categories of knowledge, attitudes, skills, and habits.

It is rather the integration of technology exceeds the traditional teacher-centered approach where learners use technology to learn 'with' and 'through' computers (Du Plessis & Webb, 2012). Introducing technology in the classroom requires an example shift in teaching and learning. Teachers are most affected by this change. Their readiness to meet the new demands for implementing curriculum will determine the success of this process. The teachers' responsibility in the process of technology integration in schools is vital, and any transition to a digital curriculum should take into account teachers' readiness to integrate technology (Cuban, 2001). Teachers' readiness is one of the major influencing factors that may affect teachers' use of technology, and it has a significant positive direct effect on technology integration in education.

2.Literature Review

2.1Types of Digital Curriculum

2.1.1Digital Simulations and Virtual Labs: Digital simulations and virtual labs provide a dynamic platform for students to explore and experiment with scientific phenomena in a controlled virtual environment. These tools allow students to conduct experiments that might be otherwise challenging or unsafe to perform in a physical lab setting. Digital simulations can offer interactive visualizations, data collection, and manipulation, allowing students to observe and analyze outcomes in real-time (Smetana & Bell, 2012).

2.1.2 Online Interactive Textbooks: Interactive digital textbooks integrate multimedia elements such as videos, animations, interactive diagrams, and quizzes. These resources offer students a multisensory learning experience that engages them through various formats. Interactive textbooks can also include features like embedded links to external resources, further enhancing students' understanding of scientific concepts (Hwang et al., 2016).

2.1.3 Data Analysis and Visualization Tools: Digital curricula can incorporate data analysis and visualization tools that allow students to explore and interpret scientific data. These tools enable students to work with real-world datasets, analyze trends, and create visual representations, fostering data literacy and critical thinking skills (Zibell et al., 2018).

2.1.4 Educational Apps and Games: Educational apps and games designed for science education offer an immersive and gamified learning experience. These tools use elements of play

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and challenge to engage students while teaching scientific concepts. Games can simulate scientific processes or present problem-solving scenarios that require applying scientific principles (Akçayır & Akçayır, 2017).

2.1.5 Online Collaborative Projects: Digital curricula can incorporate collaborative projects where students work together on scientific inquiries, research, and presentations. Online platforms enable students to collaborate regardless of their physical location, fostering teamwork, critical thinking, and communication skills while applying scientific concepts (Hämäläinen et al., 2018).

Engaged and motivated students are more likely to invest time and effort into their learning. This leads to better understanding, retention, and application of science concepts (Freeman et al., 2014). When digital resources, such as interactive simulations and multimedia content, capture students' interest, they are more likely to grasp complex scientific ideas.

Digital science curriculum can provide opportunities for students to explore real-world phenomena and conduct virtual experiments. This fosters curiosity and a sense of wonder, which are intrinsic motivators for learning (Deci & Ryan, 2000). Interactive features of digital resources encourage active participation and hands-on learning. Students can manipulate variables, analyze data, and see the immediate effects of their actions, promoting a deeper engagement with scientific content (Honey & Hilton, 2011).

Digital curriculum allows students to pace their learning and explore topics of personal interest. This autonomy empowers students and promotes a sense of ownership over their learning journey (Reeve & Tseng, 2011). Digital platforms facilitate collaboration and communication among students, encouraging peer learning and collective problem-solving. Social interaction can enhance motivation and deepen understanding through discussions (Dillenbourg, 1999). Digital assessments and quizzes provide instant feedback to students, helping them monitor their progress and identify areas for improvement. This continuous feedback loop contributes to their motivation and self-regulation (Hattie & Timperley, 2007). Incorporating strategies to enhance student engagement and motivation in a digital science curriculum is essential for promoting active learning, deeper understanding, and overall success in science education.

Students' learning preferences and experiences with different digital resources in a digital science curriculum can vary based on factors such as their cognitive styles, prior experiences, and comfort with technology. Understanding these preferences and experiences can help educators design more effective and engaging digital learning experiences. Here's an overview of learning preferences and experiences with different digital resources for students in the context of a digital science curriculum:

Visual learners prefer learning through images, videos, and visual representations. Multimedia resources, such as animations, videos, and interactive simulations, appeal to their learning style and enhance their understanding of complex scientific concepts (Mayer, 2005). Students who learn best through hands-on experiences benefit from interactive simulations and virtual labs. These resources allow them to manipulate variables, conduct experiments, and observe outcomes, providing a kinesthetic learning experience (Smetana & Bell, 2012). Some students prefer textual resources, such as digital textbooks, articles, and written explanations. These resources support analytical thinking and allow students to delve deep into textual content, making connections and extracting information (Chandler & Sweller, 1991). Students who thrive

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in social learning environments appreciate online discussion forums and collaborative activities. Digital platforms that facilitate peer interactions and group discussions allow them to share ideas, debate concepts, and learn from their peers (Hew & Cheung, 2013).

Some students prefer personalized learning experiences tailored to their pace and learning needs. Adaptive learning platforms that adjust content based on individual progress and performance resonate with these learners (Kay & Knaack, 2009). Students who enjoy problem-solving and critical thinking engage well with simulation games and interactive scenarios. These resources challenge them to apply scientific knowledge in realistic contexts and make decisions based on data (Steinkuehler & Duncan, 2008). Auditory learners prefer auditory resources, such as podcasts and audio explanations. These resources provide an alternative mode of engagement and can be effective for delivering explanations and discussions (Tao & Gunawardena, 2009).

Gamified elements, such as interactive quizzes, badges, and leaderboards, engage competitive learners. These elements provide instant feedback, rewards, and a sense of achievement, motivating students to actively participate (Deterding et al., 2011). Understanding students' learning preferences and experiences with different digital resources allows educators to tailor their instructional approaches and select appropriate tools to create a more engaging and effective digital science curriculum.

2.2Student Perspectives of Digital Curriculum

Student Engagement and Motivation in Digital Science Curriculum:

Student engagement and motivation are crucial factors in the effective implementation of a digital science curriculum. Engaged and motivated students are more likely to actively participate in learning activities, demonstrate a deeper understanding of concepts, and achieve better learning outcomes. Here's an exploration of the significance of student engagement and motivation in the context of a digital science curriculum:

Enhanced Learning Outcomes: Engaged and motivated students are more likely to invest time and effort into their learning. This leads to better understanding, retention, and application of science concepts (Freeman et al., 2014). When digital resources, such as interactive simulations and multimedia content, capture students' interest, they are more likely to grasp complex scientific ideas.

Fostering Curiosity and Exploration: Digital science curriculum can provide opportunities for students to explore real-world phenomena and conduct virtual experiments. This fosters curiosity and a sense of wonder, which are intrinsic motivators for learning (Deci & Ryan, 2000).

Active Participation: Interactive features of digital resources encourage active participation and hands-on learning. Students can manipulate variables, analyze data, and see the immediate effects of their actions, promoting a deeper engagement with scientific content (Honey & Hilton, 2011).

Personalization and Autonomy: Digital curriculum allows students to pace their learning and explore topics of personal interest. This autonomy empowers students and promotes a sense of ownership over their learning journey (Reeve & Tseng, 2011).

Collaboration and Social Interaction: Digital platforms facilitate collaboration and communication among students, encouraging peer learning and collective problem-solving. Social interaction can enhance motivation and deepen understanding through discussions (Dillenbourg, 1999).

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Immediate Feedback and Progress Tracking: Digital assessments and quizzes provide instant feedback to students, helping them monitor their progress and identify areas for improvement. This continuous feedback loop contributes to their motivation and self-regulation (Hattie & Timperley, 2007).

Incorporating strategies to enhance student engagement and motivation in a digital science curriculum is essential for promoting active learning, deeper understanding, and overall success in science education.

Learning Preferences and Experiences with Different Digital Resources

Students' learning preferences and experiences with different digital resources in a digital science curriculum can vary based on factors such as their cognitive styles, prior experiences, and comfort with technology. Understanding these preferences and experiences can help educators design more effective and engaging digital learning experiences. Here's an overview of learning preferences and experiences with different digital resources for students in the context of a digital science curriculum:

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3. Material and Method:

3.1 Research Design and Participants

A quantitative research design was selected for this study. Quantitative research allows for the systematic collection and analysis of numerical data, providing a structured and objective approach to address the research objectives. It allows for generalization of findings to a larger population, enhancing the study's external validity. Additionally, the use of statistical analyses facilitates the exploration of relationships between variables, enabling a more in-depth understanding of the research topic. The population of this study comprised secondary-level students attending public schools in District Muzaffargarh. The total number of students in the target population was 37,820, including students from Grade 9 and Grade 10. A representative sample of the population was selected using a proportionate random sampling technique. Total population was 37820 and sample size was 380 students randomly selected. The sample size was calculated for each tehsil independently using the appropriate formula, and the final sample was the sum of the sample sizes from all three tehsils.

3.2 Data Collection and Instrumentation

To assess the effectiveness of physical activities on students' mental health, a self-administered survey questionnaire was used. The questionnaire consisted of validated scales and items designed to evaluate physical activity levels and mental health indicators. The survey included questions related to the frequency and type of physical activities engaged in by the students, as well as their self-reported mental health outcomes. To ensure the validity of the survey questionnaire, face validity and content validity were established. The questionnaire was reviewed by a panel of experts in the fields of physical education, psychology, and research methodology. Their feedback was used to make necessary modifications and improvements to the questionnaire to ensure that it effectively measured the intended variables. Prior to the actual data collection, a pilot test of the survey questionnaire was conducted on a small sample of 30 elementary-level students from schools outside the selected sample. The purpose of the pilot test was to identify any potential issues with the questionnaire's clarity, wording, or format. Based on the feedback from the pilot test, necessary revisions were made to the questionnaire to enhance its reliability and validity. The reliability of the survey questionnaire was assessed using Cronbach's alpha coefficient. This measure evaluated the internal consistency of the questionnaire items in measuring the constructs of physical activity and mental health. A high value of Cronbach's alpha (typically above 0.7) indicated good reliability of the instrument. Data was collected through structured surveys administered to the selected sample of elementary students. The surveys were conducted during school hours under the supervision of trained researchers. The participants were assured of the confidentiality of their responses and were encouraged to provide honest and accurate information.

4. Analysis of Data

The gathered data was analyzed using appropriate statistical methods, including descriptive statistics and inferential statistics. Descriptive statistics such as mean, standard deviation, and frequency distributions were used to summarize the data. Inferential statistics, such as correlation analysis was employed to examine the students, perspective about digital curriculum of science among secondary-level students. The significance level for all statistical

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tests was set at $p < 0.05$. The results of the data analysis were presented in the form of tables and charts to facilitate easy understanding and interpretation of the findings.

Table 4.1: *Independent sample t-test of Students' Perspective about Digital Curriculum of Science on the basis of School Location*

Variable	School on	N	Mean	Sd	DF	t-	p-
Perception of Digital Curriculum of e	Urban	174	22.84	3.25	398	-1.81	0.071
	Rural	236	23.40	2.88			
Learning Outcomes and Performance in l Curriculum	Urban	174	23.52	2.71	398	-0.399	0.690
	Rural	236	23.63	2.73			
Accessibility and Equity in Digital ulum	Urban	174	20.27	2.39	398	-1.51	0.132
	Rural	236	20.65	2.55			
Student Preferences and Learning Styles ital Curriculum	Urban	174	23.16	2.54	398	-2.16	0.031
	Rural	236	23.69	2.36			

Note: N=Total number of students, S.D=Standard Deviation, df=Degree of freedom, t= Independent Sample t-value.

Table 4.1 shows an independent sample t-test was applied to relate the Perception of Digital Curriculum of Science scores for rural and urban of secondary school students. Statistically, there was a significant difference in results for student's perspective about digital curriculum of science of rural secondary schools (Mean=23.40, SD=2.88) and urban secondary schools (Mean=22.84, SD=3.25): t=-.311 and -1.81, p=0.071. Table 4.1 shows an independent sample t-test was applied to relate the Learning Outcomes and Performance in Digital Curriculum scores for rural and urban of secondary school students. Statistically, there was a significant difference in results for student's perspective about digital curriculum of science of rural secondary schools (Mean=23.63, SD=2.73) and urban secondary schools (Mean=23.52, SD=2.71): t=-0.399 and -1.81, p=0.690. Table 4.1 shows an independent sample t-test was applied to relate the Accessibility and Equity in Digital Curriculum scores for rural and urban of secondary school students. Statistically, there was a significant difference in results for Accessibility and Equity in Digital Curriculum of rural secondary schools (Mean=20.65, SD=2.55) and urban secondary schools (Mean=20.27, SD=2.39): t= -1.51 and p=0.132. Table 4.6 shows an independent sample t-test was applied to relate the Student Preferences and Learning Styles in Digital Curriculum scores for rural and urban of secondary school students. Statistically, there was a significant difference in results for Student Preferences and Learning Styles in Digital Curriculum of rural secondary schools (Mean=23.69, SD=2.36) and urban secondary schools (Mean=23.16, SD=2.54): t= -2.16 and p=0.031

Table 4.2 : *Independent sample t-test of Students' Perspective about Digital Curriculum of Science on the basis of School Gender*

Variable	Gender	N	Mean	Sd	DF	t-	p-
Perception of Digital Curriculum of e	Male	226	23.43	2.87	398	2.04	0.004
	Female	174	22.80	3.25			
Learning Outcomes and Performance in	Male	226	23.62	2.74	398	0.362	0.837

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l Curriculum	Female	174	23.52	2.70			
Accessibility and Equity in Digital ulum	Male	226	20.67	2.51	398	1.67	0.304
	Female	174	20.25	2.44			
Student Preferences and Learning Styles ital Curriculum	Male	226	23.69	2.36	398	2.07	0.047
	Female	174	23.17	2.53			

Note: N=Total number of students, S.D=Standard Deviation, df=Degree of freedom, t= Independent Sample t-value.

Table 4.2 shows an independent sample t-test was applied to relate the Perception of Digital Curriculum of Science scores for gender of school (Male/Female) of secondary school students. Statistically, there was a significant difference in results for Perception of Digital Curriculum of Science of male secondary schools (Mean=23.43, SD=2.87) and female secondary schools (Mean=22.80, SD=3.25): t=2.04 and p=0.004. Table 4.12 shows an independent sample t-test was applied to relate the Learning Outcomes and Performance in Digital Curriculum scores for rural and urban of secondary school students. Statistically, there was a insignificant difference in results for Learning Outcomes and Performance in Digital Curriculum male secondary schools (Mean=23.62, SD=2.74) and Female secondary schools (Mean=23.52, SD=2.70): t=0.362 and p=0.837. Table 4.2 shows an independent sample t-test was applied to relate the Accessibility and Equity in Digital Curriculum scores for male and female of secondary school students. Statistically, there was a significant difference in results for Accessibility and Equity in Digital Curriculum of male secondary schools (Mean=20.67, SD=2.51) and female secondary schools (Mean=20.25, SD=2.44): t= 1.67 and p=0.304. Table 4.12 shows an independent sample t-test was applied to relate the Student Preferences and Learning Styles in Digital Curriculum scores for male and female of secondary school students. Statistically, there was a significant difference in results for Student Preferences and Learning Styles in Digital Curriculum of male secondary schools (Mean=23.69, SD=2.36) and female secondary schools (Mean=23.17, SD=2.53): t=2.07.16 and p=0.047

5. Discussion

This study was designed to explore how secondary science teachers and science students enrolled in a high school, experience and practice the use of technology in a science curriculum. The student participants in this study provided the researcher with insight on the experiences that students have encountered with technology use in their classrooms. The faculty participants shared with the researcher strategies 89 and tools that they have implemented in their classrooms with the help of technology. The results of this study relate to the literature in various ways. Delgado et al. (2015), Vickrey et al. (2018), Harris (2016), Coyne et al. (2017), Aljuzayri et al. (2017), Gilakjani et al. (2013), Guler and Irmak (2018), and Costley (2014) were just a few noted studies that relate to the results of this present study from the literature. Delgado et al. (2015) explored the transitions that technology has made over the years not only in society but in education as well. Delgado et al. (2015) referred to the transition as the “digital revolution.”

According to Delgado et al. (2015), numerous technological instructional strategies are being used to integrate technology into K–12 classrooms. The results of this present study were in line with Delgado et al. (2015) study. The participants revealed experiences and practices that they have had with technology in the classrooms. Strategies such as using interactive websites that engage the students were a few strategies that were discussed in this present study. Vickrey

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et al. (2018) conducted research on the kinds of instructional technologies that have been used and aimed to discover the meaningful integration of technology in instructional practices.

This study was relevant to the results of this study. Instructional technologies such as interactive simulations and mobile devices have become more common in higher education (Vickrey et al., 2018). All the student participants mentioned that they have daily access to their cell phones which can be utilized as an educational tool. Technology resources such as iPads, computers, and laptops were a few resources that the participants stated that they could access. Harris (2016) noted that technology has become a fundamental part of our daily lives, being infused into entertainment, business, workforce, and educational environments. This supports the results in this study that technology is an integral part of education and can be 90 beneficial for researching as well as constructing knowledge. According to Harris (2016), the International Society for Technology in Education was founded on the principle of preparing students to compete in a technology-driven world by providing them with the skills to be technology literate; therefore, the integration of technology in the classrooms is important. The participants in this study all agreed that technology is all around them. They noted that technology is an integral part of their lives and that it is important in preparing them for the 21st century. Coyne et al. (2017) explored the crucial role that technology plays in education while uncovering barriers that may hinder teachers and students from receiving the full benefits of technology integration. The participants provided the researcher with insight on barriers that they have faced while experiencing and practicing technology in the classrooms.

6. Conclusions and Recommendations

It is concluded that there is no significant difference in Students' Perspective about Digital Curriculum of Science on the basis of School Location. It is concluded that there is no significant difference in Students' Perspective about Digital Curriculum of Science on the basis of gender. This qualitative study focused on a district level regarding the teachers and students perspective about digital curriculum of science. The population for the high school was relatively small compared to high schools located in the other districts. Both recommendations would allow for more participants. Expanding the research study would allow for a comparison to be made amongst other high schools. Knowledge was gained from conducting this study pertaining to the experiences and practices of secondary science students and secondary science students in a local community college high school program with technology integration in a science curriculum. As an educator, it is imperative to constantly seek ways to improve teaching methods and strategies. This study allowed me to think about the topic from a student's viewpoint and gain an understanding of their experiences good and bad with technology. Collecting data from students and teachers was essential for this study. There is room for advancement in integrating technology in the classroom. Based on the results of this study there is a need for future research on the benefits of technology integration. Future research on this topic should include conducting observations in science classrooms. Observing the teachers and students would allow the researcher to visibly see the student-teacher collaboration while incorporating technology and to gain a better perspective. Observations will allow the researcher to investigate how engaged the students are, the technological tools that are being utilized, and the interest of the learners.

References

1. Akçayır, Murat, and Gökçe Akçayır. "Advantages and challenges associated with

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ISSN Online: 2709-7625
ISSN Print: 2709-7615

augmented reality for education: A systematic review of the literature." *Educational research review* 20 (2017): 1-11.

2. Aljuzayri, Zahrah Hussain Binmubarak, Brandy Pleasants, and Brian Horvitz. "High School Science Teachers' Confidence with Classroom Technology Integration." *Journal on School Educational Technology* 13.1 (2017): 21-32.

3. Choppin, J., & Borys, Z. (2017). Trends in the design, development, and use of digital curriculum materials. *ZDM*, *49*, 663-674.

4. Costley, Kevin C. "The positive effects of technology on teaching and student learning." *Online submission* (2014).

5. Coyne, Sarah M., et al. "Parenting and digital media." *Pediatrics* 140.Supplement_2 (2017): S112-S116.

6. Demirci Güler, Mutlu Pınar, and Bayram Irmak. "Content Analysis of Research on Technology Use in Science Education." *Journal of Kirsehir Education Faculty* 19.3 (2018).

7. Deterding, Sebastian, et al. "Gamification. using game-design elements in non-gaming contexts." *CHI'11 extended abstracts on human factors in computing systems*. 2011. 2425-2428.

8. du Plessis, André, and Paul Webb. "Teachers' Perceptions about their Own and their Schools' Readiness for Computer Implementation: A South African Case Study." *Turkish Online Journal of Educational Technology-TOJET* 11.3 (2012): 312-325.

9. Freeman, Scott, et al. "Active learning increases student performance in science, engineering, and mathematics." *Proceedings of the national academy of sciences* 111.23 (2014): 8410-8415.

10. Gilakjani, Abbas Pourhosein, Leong Lai-Mei, and Hairul Nizam Ismail. "Teachers' use of technology and constructivism." *International Journal of Modern Education and Computer Science* 5.4 (2013): 49.

11. Hew, Khe Foon, and Wing Sum Cheung. "Use of Web 2.0 technologies in K-12 and higher education: The search for evidence-based practice." *Educational research review* 9 (2013): 47-64.

12. Hilton, Margaret L., and Margaret A. Honey, eds. *Learning science through computer games and simulations*. National Academies Press, 2011.

13. Msila, Vuyisile. "Teacher readiness and information and communications technology (ICT) use in classrooms: A South African case study." *Creative education* 6.18 (2015): 1973-1981.

ISSN Online: 2709-7625

ISSN Print: 2709-7615

14. Reeve, Johnmarshall, and Ching-Mei Tseng. "Agency as a fourth aspect of students' engagement during learning activities." *Contemporary educational psychology* 36.4 (2011): 257-267.

15. Smetana, L. K., & Bell, R. L. (2012). Computer simulations to support science instruction and learning: A critical review of the literature. *International Journal of Science Education*, *34*(9), 1337-1370.

16. Smetana, Lara Kathleen, and Randy L. Bell. "Computer simulations to support science instruction and learning: A critical review of the literature." *International Journal of Science Education* 34.9 (2012): 1337-1370.

17. Tao, Yedong. *The relationship between motivation and online social presence in an online class*. University of Central Florida, 2009.

18. Tatnall, A. (2011). Innovation translation, innovation diffusion and the technology acceptance model: Comparing three different approaches to theorising technological innovation. In *Actor-network theory and technology innovation: Advancements and new concepts* (pp. 52-66). IGI Global.