Minecraft Education helps improve learners' coding & robotics skills

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The digital game-based learning platform Minecraft Education can help learners to improve their skills in coding and robotics which will stand them in good stead when they enter the workplace of the future.

- *Offers enjoyment through play; allows for progression in learning coding and robotics skills.*
- *Hands-on, interactive nature encourages creative problem-solving and collaboration among learners.*
- *Helps sustain their interest, motivation, and active participation in coding and robotics lessons.*
- *Can equip learners with the coding and robotics skills for future workplace.*

This is according to a new study at Stellenbosch University (SU).

Mchael Vorster

"Minecraft Education and its virtual robot, the Agent, can enhance learner engagement, support the development of learners' skills in science, technology, engineering and mathematics (STEM), and provide them with a positive, meaningful, enjoyable learning experience," says Cape Town-based teacher Michael Vorster who recently obtained his master's degree in Curriculum Studies at SU.

"Coding and robotics are considered integral components of STEM education for their potential to develop 21st century skills," adds Vorster.

He focused on how Minecraft Education and the Agent can be integrated as a digital game-based tool to support the teaching and learning of coding and robotics in a Grade 7 class at an independent school in Cape Town. He wanted to find out how learners and their teacher experienced Minecraft in the classroom.

Vorster says the Grade 7 learners completed a Minecraft Virtual City project in their first term where they had to work in pairs or groups of three learners within the same Minecraft world to develop a vacant plot of their choice (residential, commercial or industrial). The groups worked in unison to create their virtual city in Minecraft while learning about city planning. Their teacher created the map with the vacant slots.

They also did a Minecraft Agent Coding Module in that same year that required them to follow a set of specific instructions to code their Agent so that it could perform specific actions such as creating a borehole, placing water inside the borehole, building an animal farm and a greenhouse. The Minecraft Agent Coding Module was linked to the United Nations 17 Sustainable Development Goals with a focus on Goal 6: Clean Water and Sanitation.

According to Vorster, his lessons observations, focus group discussions and interviews with learners, their teacher and an assistant showed that Minecraft Education holds the potential to foster engagement, collaboration, and creative problem-solving skills, and prepare learners for future technological landscapes and careers.

"Minecraft Education and the Agent significantly contribute to emotional, cognitive, and behavioural learner engagement by providing an immersive, interactive, and enjoyable learning environment. These elements help sustain learners' interest, motivation, and active participation in coding and robotics lessons."

"The game offers enjoyment through play, presents appropriate challenges, and allows for progression in learning coding and robotics skills. The hands-on, interactive nature of Minecraft Education encouraged creative problem-solving and collaboration among learners as part of their emotional and behavioural engagement when they complete tasks and overcome challenges.

"They were collaborating by helping each other to correct or 'debug' their code and celebrated together when they had completed a task successfully during the Agent Coding Module."

Vorster says that in previous coding modules, the learners would start to lose interest as soon the coding and robotics activities became too challenging.

"However, with the use of Minecraft Education, it seemed that they were able to stay engaged for longer with more perseverance and started displaying problem-solving skills to deal with more complex challenges during the coding and robotics lessons.

"A combination of Agent coding tasks and creative building tasks in Minecraft Education holds the potential to 'creatively engage' and motivate many learners with the potential to instil a state of 'flow' — being fully immersed in the activity without being distracted or losing focus — by matching their level of skill with the appropriate level of challenge."

Vorster also emphasises the role of teachers as crucial in motivating, encouraging and guiding learners during the coding and robotics module. They facilitate learning activities that encourage teamwork and help learners navigate challenges within the various Minecraft tasks.

"Feedback from the learners indicated that the teachers' input and involvement with them during a coding and robotics lesson had a direct impact on their cognitive and behavioural engagement with the tasks. A sense of belonging among learners as well as support and encouragement from teachers, were regarded as two important aspects of emotional and behavioural engagement."

Vorster says that coding and robotics activities require learners to develop a set of instructions that a robot needs to execute.

"This set of instructions forms the code that the robot follows to execute a task, for example, to move in a specific direction. Learners often find that the robot does not execute the task they anticipated, resulting in the learners having to go back to their code to correct or 'debug' it.

"It is, therefore, important to keep learners engaged, especially when coding and robotics tasks become more challenging, otherwise learners may start to lose interest and give up on the task completely without finding a viable solution to the 'bug' or error in their code."

Vorster adds that for Minecraft Education and the Agent to have the desired effect, teachers must create assignments, tasks and activities that take into consideration learner autonomy, learner independence and a sense of achievement.

He acknowledges that while a growing number of independent schools in South Africa have begun developing their own coding and robotics lessons as part of their STEM curriculum, many schools still can't afford robotics kits. "This remains a hurdle in South Africa. However, public-private partnerships could offer a potential solution to this challenge."

MORE ABOUT MINECRAFT

- Original Minecraft game officially released in 2011; bought by Microsoft in 2014.
- Allows players to be immersed in a virtual 3D world where they need to mine resources such as wood, stone and iron ore that appear in the form of blocks.
- Players can craft new materials and tools to survive in the 3D world or to apply creativity and modify the 3D world.
- Minecraft Education developed by Microsoft in 2016.
- Built-in educational features include the Agent, a camera, a portfolio, and a book and quill that learners can use for creating a digital portfolio of work to demonstrate their understanding and progress.
- Minecraft Agent is embedded in Minecraft Education Edition.
- Minecraft Agent can be used to teach coding and robotics.
- Minecraft Education can be downloaded from Google Play Store: https://bit.ly/3TA1lyi

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