Determinants of Robotics Integration by Teachers in STEM Education (Poster)

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גורמים המשפיעים על שילוב פעילויות רובוטיקה על ידי מורים בחינוך STEM (פוסטר)

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Abstract

The ongoing shortage of engineers characterizes many Western countries (OECD, 2017), including Israel (Gero & Hazzan, 2016), especially since Israel's economy is driven by its high-tech industry (Fortus & Daphna, 2020). One way to address this challenge is through educational robotics programs. Robotics programs can increase students' comfort levels with STEM applications, contribute to the development of engineering and computational thinking practices, 21st-century skills, and interest in STEM-related programs beyond high school (Tocháček et al., 2016; Ziaeefard et al., 2017). Thus, education systems in Israel and worldwide strive to increase the number of teachers who implement innovative tools like robotics in STEM lessons (Ziaeefard et al., 2017). However, many teachers choose to educate using traditional instructional strategies rather than integrating robotics activities into their classes, despite the goals of education systems and the empirical evidence of the favorable impact of doing so (Castro et al., 2018). Many STEM teachers lack the intrinsic motivation to use robotics in their classes.

This study aims to determine the factors that influence the integration of robotics activities into STEM education. In order to learn more about the aspects that

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influence the implementation of robotics activities, sixteen Israeli Arab middle school STEM teachers were interviewed. The interviewees were asked to address the enabling and inhibiting conditions for the integration of robotics activities into STEM education (e.g., what factors contribute\withhold to or inhibit the integration of robotics activities into STEM lessons). The findings identify three categories of factors that influence the integration of robotics activities into STEM education: (1) Attitudes and affect, which include: competence and self-efficacy, pressure, tension, and anxiety, and teachers' interest in robotics, (2) Support, which includes principal support, community support, technical support, and pedagogical support, and (3) Learning conditions, which include the adequate number of students in the class, availability of time, and equipment (kits, computers, suitable lab). These factors are related to the needs defined by self-determination theory (Ryan & Deci, 2000): relatedness, autonomy, and competence. The support factor is related to the sense of relatedness, which is linked to social interaction and the formation of friendships within the robotics community. Furthermore, the support factor is related to the sense of autonomy, i.e., the extent to which teachers receive autonomy from their principal in carrying out robotics activities. The attitudes and affect factor relate to feelings of competence and self-efficacy in carrying out these activities. Satisfying these needs may encourage teachers to include robotics activities in their teaching.

Keywords: Robotics activities, self-determination theory, STEM education.

מילות מפתח: פעילויות רובוטיקה, תיאוריית ההכוונה העצמית, חינוך מדעי, חינוך טכנולוגי.

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