An Instrumental Exploratory Case Study on Educators' Perceptions of Professional Development for 1:1 Technology Use

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Abstract—Professional development is necessary for the effective use of technology in the constructivist learning environment. Indiana's fifth through eighth-grade public educators were not provided adequate professional development on how to use 1:1 technology in a constructivist learning environment. The purpose of this study was to investigate the role professional development plays with 1:1 technology use in the constructivist learning environments of Indiana's fifth through eighth-grade public classrooms. There was a gap in research related to perceptions of Indiana's fifth through eighth-grade educators on the role of training for technology implementation in a constructivist learning environment. The technology acceptance model (TAM) and constructivist learning theory (CLT) served as the basis for the theoretical framework. The study's qualitative data was analyzed through inductive, thematic analysis. Research questions focused on the role of technology in Indiana's fifth through eighth-grade classrooms and the benefits of professional development for using technology in constructivism. Participants taught core subjects in Indiana's fifth through eighth-grade classrooms and had three years of teaching experience at a school implementing 1:1 technology. Data collection from 15 educators occurred on Zoom using semi-structured interviews and a focus group. Analysis revealed a lack of district-provided technology training, the advantages and prominent role of technology, its contributions to constructivism, and the prominence of constructivism in the classroom. Future studies could investigate educators beyond Indiana in grades K through 12 and use an alternate theoretical framework such as TPACK.

Keywords: Constructivist learning environment, Constructivist learning theory, Professional development, 1:1 technology, Technology Acceptance Model, Educational technology

1. INTRODUCTION

Schools implementing 1:1 technology continues to grow in numbers, as do questions concerning the degree to which educators actually integrate 1:1 technology into their classrooms (Scherer et al., 2019). As of 2020, more than 60% of Indiana schools implement the 1:1 technology initiative (Garceau, 2020). In his seminal work, Vygotsky (1978) introduced the constructivist learning theory; one that relies on educators to create a learning environment and classroom activities based on student interests and a setting relevant to each learner (Mattar, 2018). Constructivist learning environment characteristics make it conducive to implementing 1:1 technology. Mohammed and Kinyo (2020) suggested that constructivist learning approaches create a foundation for using technology in the classroom.

Educators perceive technology positively for its ability to foster learning and skills.

Carstens et al. (2021) revealed participants' perceptions regarding technology to be positive, suggesting they credit technology with enhancing learning and engaging students. Al-Anezi and Alajmi (2021) found that 90.9% of participants held positive attitudes toward technology for its ability to positively enhance both learning and teaching.

Internal and external factors affect technology acceptance by educators. Majid and Shamsudin (2019) confirmed past research of perceived usefulness (PU) and perceived ease of use (PEoU) affecting attitude toward technology (ATT) and behavioral intent (BI) to use technology. Additionally, numerous external factors emerged from studies as significant technology acceptance factors. Huang et al. (2019) identified school leaders and teacher assessments as influences. Buabeng-Andoh and Baah (2020) discovered that expectation of others for educators to use technology affected the BI to use technology.

An additional external factor, professional development, is a vital component of technology implementation. According to Wehbe (2019), 90 percent of educators desire professional training on educational technology. Phan et al. (2021) identified the need for professional development to include training on the effective use and efficiency of teaching with technology.

The purpose of this study was to investigate the role professional development plays regarding 1:1 technology use in the constructivist learning environments of Indiana's fifth through eighth-grade public classrooms. This study was necessary to understand Indiana's fifth through eighth-grade educators' perceptions of professional development's role in implementing 1:1 technology in a constructivist learning environment. If the study had not been carried out, the role of professional development in implementing 1:1 technology in the constructivist learning environment would have remained unknown. This study contributed to the existing literature by providing perceptions of an understudied population. Literature regarding Indiana's fifth through eighth-grade educators' perceptions of professional development's role in implementing 1:1 technology in a constructivist learning environment was limited. As a result of this qualitative case study, Indiana's school administrators can understand educators' perceptions of professional development's role in implementing 1:1 technology in a constructivist learning environment. These findings could lead to policy changes that result in more effective 1:1 technology professional development. More effective professional development can positively impact using 1:1 technology in the constructivist learning environment and student knowledge construction, leading to a more educated society.

2. METHODS

This study utilized qualitative research methodology. Qualitative research involves a thorough understanding of the world by capturing the perspectives of participants through unstructured data collection (McDavid et al., 2019). Investigations that use qualitative methods reveal themes and challenges through the views and experiences of individuals in a group. A scarcity of available knowledge on a topic could require qualitative methodology (York, 2020). McDavid et al. (2019) suggested qualitative methodology when investigating the perceptions of implementation, operation, and/or outcomes of programs.

2.1 Research Design

A case study aims to generalize or transfer information to a broader selection beyond the actual sample while also establishing and documenting behavior patterns (Ruffa, 2020). Umbar and Ridlo (2020) claimed case studies can identify potential issues that occur in the learning process, such as educational material and methodologies. Frey (2018) stated that case studies establish a deep understanding of a particular social unit, system, or phenomenon and provide information affecting practice, policy, and community or social action. Frey (2018) suggested that the report from a single case has the potential to hold transferable data and knowledge applicable to similar situations. Stake (1995) contributed three main types of case studies: (a) intrinsic, (b) instrumental, and (c) collective. The instrumental case study includes investigating a specific case that can create broader understanding of an issue or phenomenon (Stake, 1995). Instrumental case studies provide an understanding of professionals' opinions on policy initiatives (Crowe et al., 2011). In addition, exploratory case studies allow a researcher to identify themes from findings and can reveal an awareness of the complexity of a case (Frey, 2018). An instrumental, exploratory case study design was appropriate for this study as the goal was to discover educators' perceptions of 1:1 technology implementation and the professional development educators received in preparing them for implementation. Further, the case study design revealed the role that professional development plays regarding 1:1 technology use in the constructivist learning environments of Indiana's fifth through eighth-grade public classrooms.

Table 1. Demographics of Participants

Characteristic	Semi-structured interview	Focus group
Gender		
Male	5	1
Female	9	2
Prefer not to say	1	1
Total	15	4
Subject taught		
Math	7	2
Science	5	0
Social Studies	7	2
Language Arts	9	2
Grade taught		
5th	5	2
6th	6	0
7th	3	0
8th	6	2

2.2 Participants

Purposive sampling methods were chosen for this investigation for the deliberate selection of information-rich participants related to the topic of interest (McDavid et al., 2019; Palinkas et al., 2015). To maximize the diversity of the sample, participants were chosen from a range of experiences and both genders. Twenty-two individuals from two Indiana school districts responded to the recruitment email. Fifteen Indiana educators

participated in semi-structured interviews with four of these further contributing through the focus group. The fifteen participants represented Indiana fifth through eighth-grade educators teaching in schools implementing a 1:1 technology initiative. Table 1 displays the demographics of the participants.

2.3 Research Instruments

Two data collection instruments were utilized in this qualitative study. Semi-structured interviews were conducted with fifteen Indiana educators in grades fifth through eighth who teach in the subject areas of Language Arts, Math, Science, or Social Studies. Semi-structured interviews designs were based on the format and question model proposed by Durdella (2019). This model consisted of pre-interview, consent, interview, and post-interview stages. Questions in the semi-structured interview helped investigate the role professional development has in Indiana fifth through eighth-grade educators in using 1:1 technology in constructivist learning environments.

The second instrument used for data collection in this study was a focus group. This focus group consisted of four volunteers who agreed to further participate in this study at the conclusion of semi-structured interviews. According to Ingelgom (2020), this instrument was ideal for collecting information on a topic about which little is known. The motive of the focus group was to collect discursive data from a group discussion on of themes (Ingelgom, 2020). Krueger and Casey (2002) influenced the focus group format and the model for the questions.

2.4 Procedures

Individuals selected from a pool of participants who met inclusion criteria participated in one semi-structured interview lasting approximately 30 minutes. Following Durdella's (2019) focus group structure, interviews occurred at a time convenient to the participant and available to the interviewer. Each semi-structured interview occurred through the Zoom online meeting platform. Dependent upon participant consent, audio recordings of interviews were made using Zoom software. This assisted in transcription and analysis. Participants who completed the semi-structured interview were provided an email at the conclusion of the interview on Zoom's chat tool for submission of any future questions. These emails aligned with Durdella's (2019) post-interview process.

Five participants volunteered to further participate in the study through a focus group, aligning with Ingelgom's (2020) suggestion for the number of participants in such a tool. The availability and convenience of participants determined the time and date of the focus group. This focus group occurred through the Zoom online meeting platform, lasting approximately 60 minutes. With participants' consent, an audio recording of the focus group dialogue was made on Zoom software to aid in the analysis of the data collected. The focus group started with a welcome to participants followed by a thorough description of the topic. Guidelines for participation were given immediately followed by the opening question. Finally, ending questions were asked. The focus group included five short, natural, open-ended questions. Interaction management techniques were used that fostered participation, so all voices were given equal opportunity to be heard (Durdella, 2019). Individuals who completed the focus group were provided an email at the conclusion of the meeting through the chat tool on Zoom to submit any future questions regarding the study.

2.5 Data Analysis

Semi-structured interview data were stored, transcribed, and organized in MAXQDA software. This software allowed for the transcription of audio into text form and was compatible with the Zoom platform. Recorded audio transcripts were analyzed through inductive, thematic content analysis. Kiger and Varpio (2020) identified thematic analysis as an effective method for analyzing qualitative data and identifying repeated patterns while constructing themes. Inductive, thematic analysis required the examination of narratives related to the phenomenon by organizing these transcriptions into smaller units and performing analysis of these units (Vaismoradi & Snelgrove, 2019).

Data analysis began with the transcription of semi-structured interviews with the assistance of MAXQDA software. Following York's (2020) model for content analysis, first-level coding of audio transcriptions occurred. This coding reduced the number of words and captured the essence of the interview data (York, 2020). Next, second-level coding organized first-level codes into categories or themes based on the transcription's content. The frequency that participants expressed these themes was revealed through enumeration (York, 2020). Next, it was determined saturation had been reached based on the content of transcriptions. Finally, writing the conclusion of the coded data took place.

The data gathered from the focus group dialogue were stored and organized in MAXQDA software. Recorded audio files were analyzed through inductive, thematic content analysis following the same procedures of the semi-structured interviews. This qualitative, thematic content analysis was performed with the assistance of MAXQDA software in the same manner as the interviews.

3. RESULTS

The themes and subthemes discovered during data analysis of the semi-structured interviews and focus groups are found in Table 2. Triangulation of data from semi-structured interviews and the focus group involved identifying similarities in subthemes and themes that materialized through data analysis.

Table 2. Themes and Subthemes

Theme	Subtheme
Professional Development	Lack of training
	The effects of training
1:1 Technology	Contributes to constructivism
	Prominence in the classroom
Constructivist Learning Environment	Prominence of constructivism

3.1 Professional Development

Data analysis of semi-structured interviews and the focus group exposed a theme of professional development. Data related to this theme addressed how professional development would benefit Indiana fifth through eighth-grade educators in using technology in a constructivist learning environment. Subthemes emerged that included a lack of training and the effects of training.

All participants in semi-structured interviews spoke on the importance of training. Participant 10 identified the benefits of professional development by stating,

> I think it is very important, especially because teachers come in with different backgrounds on different types of technology. So, I think professional development specific to the actual devices that teachers are going to have in their classrooms is helpful.

The data suggested there are numerous elements training can provide that affect technology use.

All focus group participants claimed training was vital to implementing technology. Data suggested that training inclusive of the purpose and effective application of technology affects its use. Participant 19 stated, "I also think it's important that teachers are using it for the correct purpose and not to just sit a kid in front of an iPad. There's a purpose for it, and for me it's inquiry." Participants of the focus group also identified other educators, especially younger teachers, as a source of information on 1:1 technology.

According to data, districts did not provide training for technology use in a constructivist learning environment, despite participants identifying the benefits of training and the prominent roles of technology and constructivism. Only one of the 15 participants in semi-structured interviews claimed to have received this form of PD. When asked what specific training helped them implement 1:1 technology in a constructivist learning environment, Participant 8 stated, "Yeah, I don't think I've had that professional development." When inquired about district-provided professional development on usefulness or ease of technology in the constructivist learning environment, none of the four focus group participants claimed to have been provided this opportunity.

Fourteen of the 15 participants in the semi-structured interviews revealed that training affected the use of 1:1 technology in the constructivist learning environment. Participant 7 noted, "And then you have an Apple TV sitting there, and the kids all have iPads, and teachers are having them do IXL when (with proper training) they could have a more authentic learning experience." Educators in the study identified the potential effects training could have on affective use of technology in a CLE.

Participants explained that being trained on how easy and useful technology is in constructivism would affect their use. Effects included educators' use of 1:1 technology as a tool to foster constructivism. Participant 19 noted, "I think if I had some professional development, I would probably be more intentional with providing my students with opportunities to practice constructivist skills and to apply them when it would fit. I think it (professional development) would be valuable."

3.2 1:1 Technology

A second finding was that participants identified 1:1 technology as advantageous to the classroom. Participants revealed advantages such as personalized instruction, choices for remediation materials, and an increase in options for novels to read. When asked what advantages technology provides for a classroom, Participant 011 claimed,

> There is always something, literally, at their fingertips. If they're learning from home, they have something that they can continue to learn with. It's right there, and it's a tool that they are interested in. There's an immediate buy-in if they're doing something on their iPad.

Further, data analysis revealed subthemes of technology meeting the needs of constructivism and the prominence 1:1 technology has in the classroom.

According to data, 1:1 technology helped meet constructivist characteristics such as student choice, authenticity, and relevance. Technological increased interactivity and social learning opportunities. Data suggested that technology enabled the creation of presentations, communicating on Google Docs and Canvas, and the pursuit of topics in which they are interested. When asked how technology enables them to meet the characteristics of a constructivist learning environment, Participant 19 stated,

> The other thing would be to come up with their choice of presentation. This might be an iMovie or a slideshow. They've chosen voice-overs or videos where they recorded themselves and acted things out. Also, being able to use that technology to collaborate on Canvas and things like that or share a Doc where others can be adding stuff to it [the working document].

This quote supported previous research findings that technology promotes CLE characteristics such as autonomy and collaboration.

Fourteen of the 15 participants said that technology was used in more than half of all classroom tasks and assignments. Five of the 15 participants noted that more than 80% of their class tasks and assignments included the use of 1:1 technology, while one participant claimed 100% of their classroom tasks and activities included some use of technology. Uses included online programs, remediation work, individual work, research, production of student-made projects, and educational games. Participant 2 claimed many uses of classroom technology,

> Definitely reading intervention and information resources like dictionaries. We use interactive videos that they can access and then test over it or not test. But we often quiz over stuff like that. We play games where we can review.

Educators' accounts such as this support the prominent use of 1:1 technology use in the classroom.

3.3 Constructivist Learning Environments

The third theme revealed through analysis related to how professional development would benefit Indiana fifth through eighth-grade educators in using 1:1 technology in a constructivist learning environment. All participants in semi-structured interviews identified constructivist characteristics in their classrooms. When asked how they attempt to create such an environment in their classroom, participants identified autonomy, interactivity, social learning, authenticity, relevance, and learning based on student interests.

Others contributed that their classrooms display constructivist activities such as inquiry-based challenges, project-based challenges, and critical thinking challenges. Participant 019 contributed,

> I do this all the time by allowing students an opportunity to explore academic interest on topics that maybe we have discussed, or that I taught, and then they have the freedom to explore those avenues on their own. As long as it is within the realm of the standards that we're learning.

The focus group and interviews revealed similar information regarding participants claiming constructivism plays a significant role, while identifying examples of constructivism in the classroom. An analysis of data produced a subtheme that constructivism plays a prominent role in Indiana's fifth through eighth-grade classrooms.

Twelve of the 15 participants suggested that a constructivist learning environment played a significant role and filled a significant amount of time in their classroom. Participant 17 spoke of the role constructivism has in their class, "It plays a tremendous

role. It is the basis or foundation of learning in my classroom." One participant claimed the majority of class time is spent in a constructivist learning environment, "Seventy percent is constructivism. I feel like my experiences have shown me if everything is me talking the entire time they're in front of me, they disengage." Other respondents contributed that constructivism plays a significant role because it allows students to build their confidence in their interests in while promoting more instructional time with students needing the most assistance.

4. DISCUSSION

One-to-one technology supports constructivist learning theory by assisting in the creation of classroom environments that are student-centered, autonomous, personalized, collaborative, interactive, and authentic (Guo, 2018; Mattar, 2018; Zhao, 2021). Educators have positive perceptions of technology's effect on education (Hol & Aydin, 2020; Luo & Murray, 2018; McClure & Pilgrim, 2021). Specific elements affect the use of technology in the classroom (Huang et al., 2019; Majid & Shamsudin, 2019; Mazman Akar, 2019). Educators view professional development as necessary for effective technology implementation (Almalki, 2020; Frazier et al., 2019; Wehbe, 2019). Although educators in this study received training, the use of technology in a constructivist learning environment was not the focus.

Themes emerged from this study that aligned with themes identified in a thorough review of current literature: (a) 1:1 technology supports constructivism by helping create a student-centered, autonomous, personalized, collaborative, interactive, and authentic environment, (b) educators have positive perceptions of technology's effect on the classroom, (c) elements exist that affect the use of technology in the classroom, and (d) educators perceive that training is necessary for effective technology implementation.

4.1 1:1 Technology Supports Constructivism

The current study supported the theme that 1:1 technology supports a constructivist learning environment. Technology use in a constructivist learning environment allowed education to be more student centered (Mattar, 2018). The study supported this claim, with participants adding that students need a break from the traditional, teacher-centered instruction and that technology aids this shift.

Educators in this study identified the use of 1:1 technology for activities such as interactive choice boards, the pursuit of chosen research topics, and allowing students to choose presentation tools to promote autonomy. Lam et al. (2021) indicated that a personalized learning strategy sensitive to students' individual needs is more probable in an environment rich in technology.

Participants identified personalized instruction based on individual learning needs and interests as one of the key advantages of implementing 1:1 technology in the classroom. This information was supported by Arnesen et al. (2019) who posited that a classroom environment rich in technology supports the pedagogical approach of personalized learning. An and Mindrila (2020) identified student collaboration to be more possible due to various classroom technology tools. The current study found that technological tools such as Google Slides, Google Docs, and Google Forms promote constructivist characteristics through their ability to promote collaboration on topics and projects. Aydoğdu (2021) revealed a significant relationship between the use of classroom technology and the children's social activity with learners and adults in the educational setting. Participants supported this datum by claiming classroom technology like Google products foster social learning opportunities such as students interacting on

digital projects. Information that emerged from this study also supported the theme that educators have a positive perception of technology in education.

4.2 Educators Have a Positive Perception of Technology

In the current study, participants supported the findings of past research that educators hold a positive perception of technology. McClure and Pilgrim (2021) and Al-Anezi and Alajmi (2021) suggested a highly favorable perception of 1:1 technology integration and the necessity of implementation due to its ability to affect teaching and learning in a positive way. All participants in the current study suggested that classroom technology is advantageous and identified positive effects of technology integration. Authors found educators hold an overall positive attitude toward technology, specifically for its ability to increase learner motivation (Habibi et al., 2019). Participants supported this suggestion, claiming that technology is a tool in which students are interested and that there is an immediate commitment when activities are completed on their 1:1 device. Hartman et al. (2019) revealed that teachers identified educational technology as a integral contributor to student success. The current study revealed similar contributions, such as contributions from educational games and individualized instruction. Findings revealed information suggesting the use of technology is dependent on specific elements.

4.3 Technology Acceptance is Dependent on Internal and External Factors

The theme of internal and external factors affecting technology acceptance by educators exists in the current literature. Results supported the findings of previous research, suggesting that internal factors such as PU, PEoU, ATT, and BI affect the actual USE of technology. Majid and Shamsudin (2019) found that internal factors of PU affect USE of technology. The current study supported these findings, with participants suggesting teachers would be more willing to use technology if they were aware that it was possible to use technology effectively. Previous research included PEoU as an internal factor affecting technology use. Educators in the current study provided data supportive of this previous research, claiming more educators would use technology in the classroom if they were aware how easy it was.

The review of current literature also revealed external factors that influence technology use. Participants in the current study provided statements that identified some, but not all, of these factors. Huang et al. (2019) identified influences on technology use such as school leaders and teacher assessments. Participants supported these data by specifically mentioning building administrators and their own evaluations as factors affecting the use of classroom technology. Muzi et al. (2021) revealed external factors of the expectation of others, institutional support, and privacy concerns to have a significant effect on USE. Participants in the current study claimed district expectations and the expectations of building administration for educators to use technology affected technology use. However, privacy concerns were not identified as an influence on technology use.

A thorough review of recent literature revealed personal innovativeness and educators' awareness of technology as factors influencing technology use (Mazman Akar, 2019; Wei et al., 2021). Data from the current study supported past research as personal innovativeness was identified as an external factor, with participants acknowledging their desire to pursue new technology opportunities. The desire to pursue classroom technology options aligned with findings in recent studies that internal

motivation is a factor affecting the use of technology. Prior authors (Huang & Liaw, 2018) identified that educators' perceived self-efficacy to affect technology use. Educators in the current study supported this claim by speaking on the importance of confidence in their own ability to use classroom technology on multiple occasions. Professional development emerged from the current study as an important factor in effective technology implementation.

4.4 Professional Development is a Vital Component of Technology Implementation

Data from the current study supported recent research that professional development is essential to technology implementation. Professional development emerged as a theme of this study, with the effects of training and the lack of training emerging as subthemes. Hartman et al. (2019) and Wehbe (2019) found that educators were interested in professional development on classroom technology, no matter their confidence or familiarity with educational technology. All participants in the current study, regardless of their confidence level with classroom technology, identified professional development as an integral step in implementation.

The current study confirmed past findings (Frazier & Trekles, 2017) that rushing of the process and the lack of professional development provided to educators present challenges to 1:1 implementation. Participants spoke on the negative results of rushing to implement 1:1 technology, such as lacking the knowledge to effectively use the technology in class. A subtheme of the lack of training provided by districts emerged.

Frazier et al. (2019) revealed educators spent significant time training themselves on technology due to integration combining with a lack of training. This theme was confirmed in the present study, with participants claiming that they spend personal time pursuing technology options and knowledge of how to implement the technology in the classroom. Past authors (Hartman et al., 2019; Phan et al., 2021; Wehbe, 2019) suggested that educators sought training that included the effective use and efficiency of teaching with technology. The current study supported this suggestion expressing a need for training on how to use technology to meet the needs of students.

4.5 Technology Acceptance Model and Constructivist Learning Theory

Findings of the current study supported the theoretical framework. Investigating educators' perceptions of 1:1 technology fostered the emergence of themes that either support previous findings of studies using TAM or offer new factors to explore in future research. In his seminal work, Davis (1989) found relationships between the perceived usefulness of technology and the perceived ease of using technology and actual technology usage. The current study provided data supporting these findings; knowing how useful and easy to use technology is would affect their use of technology in the classroom. Data from the current study confirmed the findings of Huang and Liaw (2018), as PU and PEoU were identified as factors that predict of the behavioral intent (BI) to use technology

The current study revealed perceptions that training inclusive of ease of use and usefulness would affect attitude toward technology, intent to use technology, and the actual use of technology. These perceptions offer useful information relating to how training would benefit educators implementing technology in a constructivist learning environment. Data from the current study also helps clarify the role professional development plays regarding technology acceptance and implementation in the classroom, fulfilling the purpose of the study.

Constructivist learning (Vygotsky, 1978) approaches create a foundation for using technology in education (Mohammed & Kinyo, 2020). Technology's relevant fit and usefulness in such a learning environment can affect educators' perceptions regarding its 1:1 use in the classroom. Data suggested the use of classroom technology to assist in meeting characteristics of a constructivist learning environment. Technology plays a vital role in the constructivist learning environments of Indiana's fifth through eighth-grade public classrooms. Training would improve educators' perceptions of technology's relevant fit and usefulness in constructivism.

5. CONCLUSION

This qualitative case study focused on the perceptions of Indiana's fifth through eighth-grade core-subject educators regarding professional development, 1:1 technology, and constructivism. Findings provide a new knowledge base where, previously, little was known of the perceptions of Indiana's fifth through eighth-grade public educators on the role of professional development for 1:1 technology implementation in a constructivist learning environment. Because of this study, perceptions of the positive effects of and lack of 1:1 technology professional development is known. Additionally, the prominent role and contributions made by 1:1 technology in the constructivist learning environments of Indiana's fifth through eighth-grade classrooms is known. Finally, there is now data identifying the prominent role of constructivism in the fifth through eighth-grade classrooms in Indiana. Implications of these findings could reach leaders in higher education. Future studies should focus on educators beyond Indiana and use TPACK in the theoretical framework. Required courses on technology use in constructivism and more effective professional development could positively impact using 1:1 technology in the constructivist learning environment and student knowledge construction, leading to a more educated society.

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