



One-To-One Learning and Self-Determination Theory

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One-to-one learning refers to an instructional environment where all students have their own personal computer and relevant software available 24 hours a day, seven days a week. This qualitative phenomenological study was conducted with 11 Year Six classroom teachers who were conducting one-to-one learning programs. Through this study's analysis made using the lens of self-determination theory, it was found that teachers could use the affordances of one-to-one learning classroom environments to support students' autonomy, competence and relatedness needs, enhancing student motivation. These findings may be applicable in other similar contexts. The findings of this study provide a unique contribution to knowledge around one-to-one learning and student motivation through the lens of self-determination theory. This study will enable educators to recognise the affordances of one-to-one learning environments in optimising student motivation.

Keywords: One-to-one learning, qualitative research, autonomy, competence, relatedness

INTRODUCTION

One-to-one learning refers to an instructional environment where all students have their own personal computer and relevant software available 24 hours a day, seven days a week. In one-to-one learning environments, learners have immediate and continuous access to infinite resources and educators aim to embed technology within the curriculum. Previous researchers in the field of one-to-one learning assert that one-to-one learning environments increase student motivation. However, researchers to date have not examined student motivation in one-to-one learning environments through the lens of SDT.

SDT is a theory of motivation. Motivation researchers seek to understand what moves people to action, specifically what energises and gives direction to human behaviour (Ryan & Deci, 2017). Motivation can be defined as a force that activates, directs, and sustains goal-directed behaviour (Liu, Wang, & Ryan, 2016). SDT identifies three basic psychological needs for autonomy, competence and relatedness which, when satisfied, allow for optimal human functioning, wellbeing and growth (Ryan & Deci, 2017). Researchers such as Ryan and Deci (2017), Reeve, Ryan, Deci and Jang (2007) and

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Niemiec and Ryan (2009), have used SDT to study the affordances of learning environments which support student motivation through addressing students' needs for autonomy, competence and relatedness.

However, gaps remain for researchers in understanding how to catalyse student motivation in classrooms (Liu et al., 2016). In this paper findings are shared of a study that addressed a gap in current literature making a unique contribution to knowledge around one-to-one learning and student motivation. Teachers in the context studied were able to use the affordances of one-to-one learning classroom environments to support students' motivation by addressing students' needs for autonomy, competence and relatedness. In order for teachers to facilitate uptake of the motivational affordances of one-to-one learning environments, teachers first must be able to recognise these affordances. In addition, teachers must be able to manipulate classrooms to optimise the potential of one-to-one learning environments. It is important to understand the effects of teaching practice on student motivation as teachers' approaches to motivation can support or harm student learning (Ryan & Deci, 2017). The findings of this study have implications for teaching practice in other similar contexts, as well as for future research and educational policy to address optimal student motivation.

In the following sections, an overview is provided of one-to-one learning, SDT, and the participants, settings and data analysis method of this study. Next the findings are presented and discussed that is, in the context of this study, one-to-one learning environments enabled educators to address learners' psychological needs for autonomy, competence and relatedness. These findings may be applicable in other similar contexts. The application of SDT in one-to-one learning environments offers educators strategy to optimise the latent motivational possibilities of one-to-one devices in the classroom. Last, recommendations for further studies are outlined.

Context and Review of Literature

One-to-One Learning

Learning environments where all students have access to technology through a one-to-one ratio have become commonplace. The world's first one-to-one learning program was founded at the Australian Methodist Ladies' College Junior School in 1990 (Bebell, 2005; Methodist Ladies College, 2017). Since then, decreasing technology costs, combined with the lighter weight and smaller size of laptops, availability of wireless connectivity and longer battery life have made such initiatives more feasible to implement on a broad scale (Penuel, 2006). One-to-one learning programs now exist in a variety of primary, secondary, public and private school settings in Australia, the United States, Asia and Europe.

The implementation of a one-to-one learning program is a potential catalyst for change in teaching practice and student learning. Keane and Keane (2017) argue that effective use of technology in education can have a significant impact on teaching and learning. Researchers have found that implementation of one-to-one learning results in changes to teaching practice and student learning including increases in self-directed learning and more engagement in learning among students. For example, in their qualitative study of

18 elementary, middle and high school classrooms, Varier et al. (2017) explored teachers' use and integration of one-to-one learning devices and the perceived impact of one-to-one learning on student motivation and engagement. The authors found that, in a one-to-one environment, students became more self-directed and independent as learners. Likewise, in a mixed method study of the use of one-to-one technology in classrooms in New Zealand, Lindsay (2016) found that one-to-one learning increased student-directed learning and student engagement in learning.

Other researchers have found improvement in student motivation in one-to-one learning environments. For example, Lindsay (2016), Swan, Van 't Hooft, Kratoski and Schenker (2007), Varier et al. (2017) and Zheng, Warschauer, Lin and Chang (2016) have examined student motivation in one-to-one learning environments with findings that students were more motivated learners in one-to-one learning environments. In their mixed methods study of 16 kindergarten to Year Seven one-to-one learning classrooms, Swan et al. (2007) found that teachers reported that one-to-one learning enhanced student motivation. Zheng et al. (2016) found in their research on the synthesis of 65 journal articles and 31 doctoral dissertations published from January 2001 to May 2015 on the effect of one-to-one laptop programs on teaching and learning in Kindergarten – Year 12 schools that students in one-to-one laptop learning environments have higher levels of motivation than students in non-laptop or shared laptop classrooms.

However, the author's review of the relevant literature revealed no previous studies that examined student motivation in one-to-one learning environments through the lens of SDT and its components of autonomy, competence and relatedness. This study was unique in the researcher's use of the lens of SDT to examine how teachers could use the affordances of one-to-one learning environments to address students' psychological needs for autonomy, competence and relatedness.

To optimise the motivational affordances of one-to-one learning environments, educators and policy makers should understand how these environments enhance student autonomy, competence and relatedness. Researchers use SDT as a framework to study the conditions that foster motivation, growth, wellbeing and quality of performance (Ryan & Deci, 2000). Proponents of SDT maintain that, when students' basic psychological needs for autonomy, competence, and relatedness are supported in the classroom, students are more likely to learn and be engaged in their studies (Niemiec & Ryan, 2009). Indeed, proponents of SDT posit that students' natural tendency to learn is perhaps the greatest resource for educators to draw on to enhance learning outcomes (Niemiec & Ryan, 2009).

Self-Determination Theory

SDT denotes an empirically based theory of human behaviour and personality development that defines and describes intrinsic and extrinsic motivation and their sources, as well as the respective roles of each type of motivation in individual cognitive and social development (Liu et al., 2016; Ryan & Deci, 2017). Proponents of SDT assume that people are inclined to engage in their environment by nature, assimilating new knowledge and skills and integrating them into a coherent psychological structure

(Reeve et al., 2007). SDT includes the ways in which social and cultural factors facilitate or undermine people's sense of volition and initiative (Ryan & Deci, 2017).

Proponents of SDT identify three basic psychological needs for autonomy, competence and relatedness which, when satisfied, allow for optimal human functioning, wellbeing and growth (Ryan & Deci, 2017). Specifying human needs allows researchers to identify social contexts that satisfy fundamental psychological needs, thus enhancing high quality motivation, healthy development and wellbeing and promoting effective functioning and integrated development (Ryan & Deci, 2017). Proponents of SDT argue that conditions to support the individual's experience of autonomy, competence and relatedness foster high quality forms of motivation and engagement, including enhanced performance, persistence and creativity (Ryan & Deci, 2000). Further, proponents of SDT propose that social settings that undermine people's experience of autonomy, competence and relatedness are detrimental to wellness in that setting (Ryan & Deci, 2000). Thus, SDT researchers characterise social environments by the extent to which they support autonomy, competence and relatedness (Ryan & Deci, 2017).

Researchers have used SDT to study education. Research in SDT demonstrates that school environments can facilitate a sense of positive autonomous motivation in students. In their discussion of SDT, Ryan and Deci (2017) state that school environments can support individuals flourishing such that they feel empowered, confident in their learning and problem solving, and feel a sense of belonging to the school and larger community. Further, in their discussion of students' autonomous self-regulation in classrooms, Reeve et al. (2007) assert that, when learning conditions support students' basic psychological needs, intrinsic motivation, wellbeing and high-quality learning among students increase.

Researchers have also used SDT to study internet-based learning technologies. For example, Alm (2006) has described how internet-based learning environments in particular Web 2.0 applications can fulfil learners' psychological needs for autonomy, competence and relatedness. Other researchers such as Gonzalez and St. Louis (2008), have found that internet-based tools such as blogs, wikis and social networking platforms can foster learner autonomy, competence and connectedness, promoting students' motivation to learn. In addition, March (2007) described the potential of using WebQuests to motivate students intrinsically by promoting satisfaction of students' psychological needs. Ng and Hussain (2009) found YouTube highly effective in supporting student autonomy, competence and relatedness by facilitating peer learning and self-regulation.

Researchers have examined students' autonomous motivation in education or SDT in relation to internet applications. However, the affordances of one-to-one learning exceed the internet applications described in studies to date. Through the present study, affordances were identified for teaching practice and student learning in one-to-one learning environments. Novel affordances identified in this study go beyond the online applications identified in previous studies, highlighting opportunities for student autonomy, competence and relatedness that may result in enhanced student motivation.

METHOD

Participants and setting

The setting for this study was a rural city in Victoria, Australia. Five government primary schools in the city, each operating one-to-one learning programs in their Year Six classrooms, were invited and agreed to participate in this study. These five primary schools catered for Preparatory to Year Six. The average age of the Year Six students in these schools was twelve years old. The schools ranged in the size of their student population from 135 students to 607 students. The Index of Community Socio-Educational Advantage for these schools ranges from 981 and 1122. The Index of Community Socio-Educational Advantage considers factors that influence students' educational outcomes including parental occupation and education, the school's geographical location and the proportion of Indigenous students (Australian Curriculum Assessment and Reporting Authority, 2017). The average Index of Community Socio-Educational Advantage for schools in Australia is 1000.

Students in these schools were provided with laptop, wireless-enabled mini computers, which were equipped with 28 educational software programs. The Government of Victoria subsidised the cost of the laptops. Parents of Year Six children paid AUD\$52 per year to lease the laptops for their child's use at home and school. The Government of Victoria provided all schools with wireless access points for the laptops, and in-school technical support personnel. Teachers participating in this program could attend government-funded professional development workshops designed to assist teachers in integrating one-to-one learning into their classroom teaching and learning practice.

All Year Six teachers in these schools were invited to participate in this study. Of these, 11 teachers from the five primary schools agreed to participate in the interviews. Three participants were from School A, two from School B, one from School C, one from School D, and four from School E. Of the three Year Six teachers from School A who agreed to participate in the interviews, one female teacher, had been teaching for 20 years, the second female teacher had been teaching for more than 20 years and the third participant was a male teacher who had been teaching for 4 years. These three teachers were interviewed together.

Of the two teachers from School B who participated in the interviews, one was a male teacher who had been teaching for 18 years and the second teacher was also male and had been teaching for 14 years. These 2 teachers were interviewed together. The female teacher from School C had been teaching for 10 years and the female teacher from School D had been teaching for 10 years. The teachers from School C and School D chose to be interviewed together. Of the four teachers from School E, one was male who had been teaching for 30 years, the second teacher was female and had been teaching for 5 years. The third teacher was female and the fourth teacher was also female and had been teaching for 21 years. See Table 1: 'Participants and Setting'

Table 1
Participants and Setting

	School A	School B	School C	School D	School E
School ICSEA	1122	981	1007	982	1051
Student Population	520	135	386	282	607
Participants and number of years teaching	Female, 20 years teaching Female, more than 20 years teaching Male, 4 years teaching	Male, 18 years teaching Male, 14 years teaching	Female, 10 years teaching	Female, 10 years teaching	Male, 30 years teaching Female, 5 years teaching Female, 6 years teaching Female, 21 years teaching

Data collection

This research was conducted using qualitative phenomenological approach. In qualitative phenomenological research individual experiences of a phenomenon are described. The purpose of phenomenological research is to obtain a view of the participants' life-worlds and to understand the personal meanings they have constructed from their lived experiences (Johnson & Christensen, 2008). The primary data collection method in a phenomenological research approach is in-depth interviews (Johnson & Christensen, 2008). The researcher purposefully selects individuals who have experience with the central phenomenon being explored and can provide the information necessary to understand the phenomenon (Creswell & Plano Clark, 2007).

After obtaining university ethics approval, permission to conduct this study was obtained from the Victorian Department of Education and Early Childhood Development, as well as school principals and teachers at schools participating in this study. Small group interviews were used in this study as they offer an advantage in qualitative research because interaction between group participants is more likely to yield clear information than interviews between researcher and an individual participant (Creswell, 2005). Four small group interviews, approximately two hours long were conducted using an interview guide approach. Participants were informed of topics to be covered in advance and the researcher decided the sequencing and wording of questions during the course of the interview (Johnson & Christensen, 2008). Where possible and without interrupting the natural flow of conversation, or the participant's train of thought, the researcher directed each interview in a similar manner to facilitate discussion around the two main research topics: (1) What are the affordances of one-to-one learning for teaching practice, and (2) What are the affordances of one-to-one learning for student learning? This type of interview ensures that data collected is comprehensive and allows for systematic collection in conversational interviews (Johnson & Christensen, 2008). Questions asked during the guided interviews included:

- How has one-to-one learning affected your teaching practice?
- How have you integrated the one-to-one devices into your lessons?

- Do you believe that one-to-one learning is beneficial for teaching and learning?
- Has one-to-one learning facilitated cooperative group work in your classroom?
- Has one-to-one learning facilitated individual student work in your classroom?
- Has one-to-one learning made learning more interesting or enjoyable for students?
- Has one-to-one learning encouraged your students to take more responsibility for their learning?
- Has one-to-one learning effected your students' motivation or engagement with learning?
- Has one-to-one learning effected your students' attitude to school?
- What are the benefits of one-to-one learning for the teacher and student?

All interviews were digitally recorded and transcribed for data analysis.

Data analysis

After collection, data were analysed using thematic analysis (Creswell, 2005). Initially the data were coded using a deductive approach and descriptive coding. Saldana (2009) defines descriptive coding as the summarising of the topic of a passage of qualitative data into a word or a short phrase. Descriptive coding is appropriate for the coding of interview transcripts as it provides the researcher with an organisational grasp of the study. Descriptive coding is an essential foundation for secondary coding and data analysis (Saldana, 2009). In this first cycle of coding, tags were used to assign units of meaning to the descriptive information compiled during the study (Johnson & Christensen, 2008). The first cycle data coding tags used were; '*internet*', '*multimedia*', '*communication*', '*engagement*', '*motivation*', '*higher order thinking*', '*projects*', '*collaboration*' and '*technology skills*'.

Findings in this initial analysis appeared to align with SDT. A secondary cycle of coding was then undertaken, using an inductive approach to examine this alignment. Secondary cycle coding is an advanced method of reanalysing coded data. Through secondary cycle coding, categorical and thematic organisation is developed from the array of first cycle codes (Saldana, 2009). Initial findings in the secondary cycle coding were analysed further using tags that correlated with the three components of SDT: '*autonomy*', '*competence*' and '*relatedness*'. Inductive coding starts with the data, testing conclusions against the relevant literature (Twining, Heller, Nussbaum & Tsai, 2017). Similarities, differences and correspondences in the data from the participants were examined and compared with literature on SDT. Descriptions of the participants' interview data were constructed using verbatim excerpts from their interviews to facilitate an understanding of the participants' experiences (Yüksel & Yıldırım, 2015). This paper only reports findings from this study regarding SDT psychological needs of autonomy, competence and relatedness. In line with inductive reasoning, the author's review of the relevant literature fed into the data analysis process (Twining et al., 2017). For this reason, the literature review has been included in the results and discussion section of this paper.

FINDINGS AND DISCUSSION

The findings obtained through thematic analysis have been organised under the SDT components of autonomy, competence and relatedness which were the inductive coding themes. Relevant literature around SDT and one-to-one learning has been taken into consideration in each section.

Autonomy

Autonomy refers to students' need to self-regulate their experiences, to be the causal agent of their own actions and to act in harmony with their own integrated selves (Ryan & Deci, 2017). Reeve (2016) proposed that the best way to facilitate student autonomy is to give students the freedom to choose what they would like to do within the context of the learning activity. Teachers in this study offered many examples of teaching practices and student learning in their one-to-one learning classrooms which offered students freedom to choose what they would like to do within the context of the learning activity. These examples illustrate how one-to-one learning environments can be autonomy-supportive. One teacher from School E offered this example:

"We looked at an article on 'Ice Men' and it sparked a particular interest in some students and therefore that becomes a particular channel of learning that some students may go down, but some may not. The overall parameters of the task are set up, but where it finishes is dependent on the interests of the students and what they actually find out."

In another example, a teacher from School A said:

"Often during a lesson either myself or a student will have an idea for extending or differentiating the lesson by utilising the one-to-one laptops. As I no longer have to book a computer lab in advance to incorporate ICT, I am now able to instantly change the direction of the lesson to incorporate new ideas immediately. This flexibility in class will often then result in more suggestions from other students building on a previous suggestion. Ideas and alternatives continue to flow enabling the lesson to evolve in real time, largely directed by the students."

Another teacher from school A observed that students tended to direct learning activities more actively, and thus had greater input into their learning when they had access to one-to-one laptops:

"Since the introduction of the one-to-one laptops, lesson planning has become more relaxed, allowing the students to have more freedom in directing the lesson themselves. It's not that it's ad hoc [the lesson planning], you still have to teach, for example, the spelling rules, it's more of an openness about it because the students might discover something and then you say, 'Oh, let's go with that.' Previously I have always had in mind where a lesson was going, now lesson planning is not quite so rigid, and a lesson could end up in lots of places depending on the students."

These examples illustrate how teachers in this study used the affordances offered in one-to-one learning environments to provide students with choices and opportunities to take initiative in and direct their own learning.

Teachers facilitated one-to-one learning classroom climates, which nurtured their students' curiosity, interest, and intrinsic motivation. When students direct their learning according to their interests as causal agents in their learning experience, student autonomy and motivation improve (Deci, Ryan, & Williams, 1996). So too, Deci and Ryan (2016), Reeve (2016) and Reeve et al. (2007) assert that autonomous learning environments allow students to generate their own intentions and engage in lessons with an authentic sense of motivation and purpose, because they find learning enjoyable, interesting and meaningful. The results of this study offered evidence of students in one-to-one learning environments generating their own intentions, engaging in learning because they found the content and activities interesting.

This study also found examples of teachers in one-to-one learning environments giving students greater input into the direction of learning activities. The one-to-one learning environment enabled teachers to take an approach to lesson planning that was flexible, sensitive to and dependent on students' voices and needs. Reeve and Halusic (2009) identified that, in order for teachers to support student autonomy, teachers must be willing and able to see students' perspective during learning activities and to solicit student input into learning activities. In addition, Niemiec and Ryan (2009), Reeve (2016), and Reeve et al. (2007) found that teachers could provide conditions to support student autonomy and motivation by encouraging students to voice their opinions and, in turn, responding to students' opinions. This study found examples that demonstrated how one-to-one learning environments facilitate autonomy-supportive instruction, such as offering the affordance for a flexible approach to lesson planning.

Although not examined through the lens of SDT, other researchers have also found that one-to-one learning environments provide students with opportunities to direct their own learning. For example, in their meta-analysis of studies examining the effect of one-to-one laptop programs on teaching and learning processes and outcomes, Zheng et al. (2016) found that one-to-one laptop programs facilitated student-centred learning, with students having more autonomous control over their learning paths. Likewise, in their qualitative study of the implementation of one-to-one devices in a school in the mid-Atlantic region of the United States Varier et al. (2017) found that teachers noted that students in one-to-one learning environments became more self-directed and independent learners.

Competence

Competence is the need to interact effectively with one's environmental surroundings, to seek out optimal challenges, take them on, and exert persistent effort and strategic thinking to make progress in mastering them (Reeve, 2016). Competence-supportive pedagogy provides experiences that support students to attain mastery in their learning (Niemiec & Ryan, 2009), offers students feedback around effective effort, and scaffolds and clarifies tasks to help students to develop feelings of efficacy (Ryan & Deci, 2013).

Teachers in this study reported many one-to-one learning scenarios which, when examined through the lens of SDT, illustrated how one-to-one learning environments can be competence-supportive. Teachers were able to give students opportunities to

develop competence by maximising the affordances inherent in a one-to-one learning environment. For example, teachers from School A explained how they used the one-to-one laptops to challenge students' thinking:

"The students wrote and edited articles which they then audio recorded themselves reading. They put all these recordings together with photos and videos into a movie. It was a sizeable job, it's not just one simple task, there are about 11 steps to complete the articles, the audio, the visual, the opening and closing and to get it to all work together. There is a lot of thinking through what needs to happen next. So I tell them, 'This is what we are going to have at the end, what do we need to do to get there?' Some kids got it straight away and some kids needed a bit more teaching with it, but everyone knew what the aim was."

A teacher from School C explained:

"A few months back we did some work on a Transport Accident Commission advertisement. We viewed the advertisement on YouTube and then we linked it to our blog and then the students did some further internet research. The students are able to instantly get on board with the topic and really take it somewhere. You can discuss a topic all week and set tasks each day that get deeper and deeper."

A teacher from School D offered an example of students exploring topics in greater depth since the introduction of one-to-one learning:

"There has been a lot more follow up discussion. For example, some kids might say, 'Oh last night I looked up...' whereas that might not have actually happened before because they had to fight for computer time at home with their siblings. Having access to a laptop all of the time means that they will actually go and look up something which they are wondering about. There is more home learning, as opposed to just the 'homework that I have to do'. The students following through their personal interest and being able to access information has been a difference."

Another teacher from School A said that one-to-one laptops had helped her students to engage with their learning more deeply in the classroom, through students using the laptops as a tool to facilitate reflective thinking:

"We get the kids to go back after they have done an activity and look at how they did it, reflecting on the strategies that they used. The students realised that they weren't just guessing how to do something, that they used strategies. We have been doing a lot more reflective activities with the laptops and that is part of the justification of why we think that it is important that they have these laptops in the classroom. Their true value is in their use as a reflective journal, a portfolio including reflections on their work."

Teachers also supported student mastery by providing students with opportunities to attain competence and become powerful agents in their own learning:

"Using their laptops, the students video record themselves explaining how to do something, such as a Mathematics equation. They set themselves up with a whiteboard, so they can use it to illustrate examples and record themselves explaining how to solve this problem. They keep the videos on their laptops and next time they come across a problem, instead of having to come to us, they can remind themselves when they look at

their own video. They save this recording and can refer back to it later to support their own learning, thus creating their own learning resource.”

The technical challenges inherent in a one-to-one learning environment also enabled students to attain mastery and demonstrate competence, as a teacher from School A reflected:

“I think the laptops have let students know that teachers are not the ‘holders of all knowledge’ and that they may be the ‘teacher’ in some instances. Students share their skills with the teachers and with other students, and as the students have become the experts the ‘balance of power’ has changed in the classroom. The laptops illustrate that computers are a tool for learning and that the control is up to the individual.”

These examples illustrate how teachers in this study used the affordances of one-to-one learning environments to provide students with learning challenges and to support them as they made progress in mastering these challenges. Teachers used one-to-one learning affordances such as enabling students to participate in complex multimedia projects, explore topics in greater depth, reflect on their thinking and learning, and create learning resources to provide competence supporting environments.

In addition, teachers in this study supported student competence in a one-to-one learning environment by allowing students to learn by trial and error and to make mistakes in their learning journey. Often, learning is the result of trials and experiments that lead to competence, rather than the product of continuous success (Deci & Ryan, 2016). Therefore, in facilitating competence, teachers should allow students to navigate challenges, making mistakes as they learn. Learning from mistakes and receiving feedback and clarification about tasks supports feelings of efficacy among students (Ryan & Deci, 2013).

Relatedness

Relatedness is the need to be involved in warm relationships characterised by mutual concern, liking, caring and acceptance (Reeve, 2016; Ryan & Deci, 2017). Teachers in this study reported increased social interactions between students, as well as peer caching, peer connectedness and tolerance for others as a result of one-to-one learning. Teachers at School A said:

“Some of the kids have taken on different roles. It has been really good for one of my boys who is not a very social kid. But with technology he is fantastic. He ran a workshop teaching ‘Game Maker’ to his peers. He had a huge learning curve in thinking, ‘How do I teach these other kids and tolerate the different levels and not get frustrated that they do not understand?’ It was huge for him. Initially he would do big jumps; he would know in his head what he meant and he would expect everybody else to be able to jump with him. This experience improved his communication skills, his tolerance, and appreciation of other people and their differences. It also improved the other students’ tolerance and appreciation of him.”

Likewise, a teacher from School D explained:

“Especially because the children that do have the laptop technology skills aren’t necessarily the academics or the students who always know all the right answers. It is

often different kids, ones who do not usually have success who are getting to be leaders in the classroom. It is these students who will say, 'Here, I will show you.' More so than I ever thought would occur, it has been the crossing over of these kids that you would not expect. The peer coaching and interaction has been the most powerful thing to come out of the one-to-one laptop program really."

Another teacher from School D observed:

"The peer coaching and peer connectedness that has occurred with the one-to-one laptops has been a driver in the students' engagement in learning. The laptops have improved the communication between everyone in the room, if someone finds something good it is shared more now than it was in the past."

These examples illustrate how one-to-one learning environments can facilitate authentic opportunities for students to develop and express mutual concern, liking, caring and acceptance for one another, expressed as peer tutoring and sharing of resources in the classroom. Meeting students' needs for relatedness enhances their intrinsic motivation, performance and wellbeing (Reeve et al., 2007; Ryan & Deci, 2017).

CONCLUSION AND RECOMMENDATION

This paper has addressed a gap in current education knowledge by reporting on how teachers can use the affordances of one-to-one learning environments to meet learners' psychological needs for autonomy, competence and relatedness. This use of SDT in this study is unique in the relevant literature to date, highlighting future directions in education that would enable educators to manipulate the one-to-one learning environment to optimise student motivation. This study found that one-to-one learning environments addressed learners' needs for autonomy, competence and relatedness.

Autonomy - Students in one-to-one classrooms were able to be more autonomous learners, exercising choice, taking ownership of and self-directing their learning experiences. Teachers supported students' need for autonomy by adopting more flexible approaches to lesson planning, allowing for the direction of lessons to be instantly changed in response to student suggestions. This flexibility often resulted in more suggestions from other students building on previous suggestions. This enabled teachers to evolve, extend or differentiate lessons in real time, largely directed by students. Students utilised the laptops as a tool to facilitate their individual learning journey. Students negotiated the direction of their learning to include their personal interests, goals and areas of curiosity.

Competence - In one-to-one classrooms, students' need for competence in seeking out challenges and exerting persistent effort and strategic thinking to master challenges was supported by increased participation in complex multimedia projects, exploring topics in greater depth, reflecting on their thinking and learning and creating learning resources. One-to-one laptops enabled students to explore topics in greater depth and from various perspectives to deepen and broaden their knowledge. Students were more likely to continue exploring topics at home in self-initiated home learning activities. Students used the one-to-one laptops as a reflective journal, making explicit connections between pieces of information. Students in the one-to-one learning environment quickly gained

technical mastery of the laptops, which they used to educate their teachers and peers. The one-to-one devices enabled students to create their own learning resources, which they could refer back to later to support their own mastery in learning. Students participated in complex multifaceted multimedia projects, which required learning through trial and error in order to attain mastery.

Relatedness - In one-to-one learning environments, students' need for relatedness was supported as they interacted and connected with their peers in authentic caring relationships. Through these interactions, students improved their communication skills, tolerance, and appreciation of other people and their differences. Teachers noted that many students without track records of academic success or leadership in the classroom volunteered to teach their peers and teachers in one-to-one classrooms. Students shared knowledge with each other more often in one-to-one learning environments. Teachers described this increase in peer coaching and interaction as the most valuable result of the one-to-one learning program in terms of learning outcomes and student development.

Through the lens of SDT, this study found that teachers participating in this research were able to use the affordances of one-to-one learning classroom environments to support student autonomy, competence and relatedness needs, therefore supporting student motivation, healthy development, wellbeing, engagement, enhanced performance, persistence and creativity. These findings may have applicability in other similar contexts.

Qualitative research is useful for studying a small number of cases in depth, describing complex phenomena and providing an understanding and description of people's personal experiences of phenomena (Johnson & Onwuegbuzie, 2004). However, qualitative research has limitations. For example, knowledge produced through qualitative research may not apply to other people or other settings (Johnson & Onwuegbuzie, 2004). This study was limited by the small number of participants, all of whom taught Year Six in government primary schools in regional Australia. Further studies with more participants in a greater variety of educational settings are recommended to assess the applicability of these findings in other contexts with other educators and students.

In addition, qualitative data collection and analysis is inevitably subjective (Twining et al., 2017), with results more easily influenced by the researcher's personal biases and idiosyncrasies (Johnson & Onwuegbuzie, 2004). Every attempt has been made to minimise the effect of researcher bias on this study. However, as this study is the first to report these findings, further research in the field of SDT and one-to-one learning is recommended to confirm the findings of this study.

As the mere presence of one-to-one devices in the classroom will not ensure that students' psychological needs are met, it is recommended that teachers working in these environments receive professional development to support them in maximising motivational affordances of one-to-one learning. Further, it is possible that teachers could unknowingly use the devices in ways that restrict students' self-determination in

learning—for example, by telling students how they should use their devices, limiting students' time for independent research, or putting constraints on students' use of devices. Teacher professional development to address motivationally-supportive pedagogy is also recommended.

In conclusion, by identifying learning environments that offer high levels of autonomy, competence and relatedness support, educators can enhance student motivation, wellbeing, quality of learning, performance, persistence and creativity. To date, researchers examining SDT in education have focused mainly on student autonomy or the application of internet based technologies. However, the application in this study of SDT in one-to-one technology learning environments is novel, offering educators knowledge to optimise the motivational potential of one-to-one devices in the classroom. The findings of this study have implications for teaching practice, future research and the direction of educational policies to optimise student motivation.

REFERENCES

- Alm, A. (2006). CALL for autonomy, competence and relatedness: Motivating language learning environments in Web 2.0. *The JALT CALL Journal*, 2(3), 29–38.
- Australian Curriculum Assessment and Reporting Authority. (2017). *My school*. Retrieved 10 July, 2018 from <https://www.myschool.edu.au/>
- Bebell, D. (2005). *Technology promoting student excellence: An investigation of the first year of one-to-one computing in New Hampshire middle schools*. Retrieved 10 July, 2018 from <http://www.bc.edu/research/intasc/>
- Creswell, J. W. (2005). *Educational research: Planning, conducting, and evaluating qualitative and quantitative research*. Upper Saddle River, New Jersey: Pearson Education.
- Creswell, J. W., & Plano Clark, V. L. (2007). *Planning and Conducting Mixed Methods Research*. Thousand Oaks, California: Sage Publications.
- Deci, E. L., & Ryan, R. M. (2016). Optimizing Students' Motivation in the Era of Testing and Pressure: A Self-Determination Theory Perspective. In: Liu, W. B., Wang, J. C. K., & Ryan, R. M. (Eds.), *Building Autonomous Learners Perspectives from Research and Practice using Self-Determination Theory*. Retrieved 10 July, 2018 from <https://link-springer-com.ezproxy.lib.swin.edu.au/book/>
- Deci, E. L., Ryan, R. M., & Williams, G. C. (1996). Need satisfaction and the self-regulation of learning. *Learning and Individual Differences*, 8(3), 165–183.
- Gonzalez, D., & St. Louis, R. (2008). The use of web 2.0 tools to promote learner autonomy. *Independence*, 43(1), 28-32.
- Johnson, B., & Christensen, L. (2008). *Educational research: Quantitative, qualitative and mixed approaches*. Los Angeles, California: Sage Publications.

- Johnson, R., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33(7), 14-26.
- Keane, T., & Keane, W. (2017). Achievements and challenges: Implementing a one-to-one Program in a secondary school. *Education and Information Technologies*, 22(3), 1025-1041.
- Lindsay, L. (2016). Transformation of teacher practice using mobile technology with one-to-one classes: M-learning pedagogical approaches. *British Journal of Educational Technology*, 47(5), 883-892.
- Liu, W. C., Wang, J. C. K., & Ryan, R. M. (2016). Understanding Motivation in Education: Theoretical and Practical Considerations. In: W. B. Liu, J. C. K. Wang, & R. M. Ryan (Eds.) *Building Autonomous Learners Perspectives from Research and Practice using Self-Determination Theory*. Retrieved 10 July, 2018 from <https://link-springer-com.ezproxy.lib.swin.edu.au/book/>
- March, T. (2007). Revisiting WebQuests in a Web 2 world. How developments in technology and pedagogy combine to scaffold personal learning. *Interactive Educational Multimedia*, 15, 1–17.
- Methodist Ladies College, (2017). Technology in learning. Retrieved from <https://www.mlc.vic.edu.au/MLC-Difference/Technology-in-Learning>
- Ng, H. Z., & Hussain, R. M. R. (2009). Empowering learners as the owners of feedback while YouTube-ing. *Interactive Technology and Smart Education*, 6(4), 274–285.
- Niemiec, C. P., & Ryan, R. M. (2009). Autonomy competence and relatedness in the classroom. Applying self-determination theory to educational practice. *Theory and Research in Education*, 7(2), 133-144.
- Penuel, W. R. (2006). Implementation and effects of one-to-one computing initiatives: A research synthesis. *Journal of Research on Technology in Education*, 38(3), 329-348.
- Reeve, J. (2016). Autonomy-supportive teaching: What it is, how to do it. In: W. B. Liu, J. C. K. Wang, & R. M. Ryan (Eds.) *Building Autonomous Learners Perspectives from Research and Practice using Self-Determination Theory*. Retrieved 10 July, 2018 from <https://link-springer-com.ezproxy.lib.swin.edu.au/book/>
- Reeve, J., & Halusic, M. (2009). How K– 12 teachers can put self- determination theory principles into practice. *Theory and Research in Education*, 7(2), 145–154.
- Reeve, J., Ryan, R. M., Deci, E. L., & Jang, H. (2007). Understanding and Promoting Autonomous Self- Regulation: A Self- Determination Theory Perspective. In: D. Schunk, & B. Zimmerman (Eds.) *Motivation and Self- Regulated Learning: Theory, Research, and Application*. Retrieved 10 July, 2018 from <https://ebookcentral.proquest.com/lib/swin/>

- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55, 68-78.
- Ryan, R. M., & Deci, E. L. (2013). Toward a social psychology of assimilation: Self-determination theory in cognitive development and education. In B. W. Sokol, F. M. E. Grouzet, & U. Muller (Eds.) *Self-regulation and autonomy: Social and developmental dimensions of human conduct*. New York, New York: Cambridge University Press, pp. 191–207.
- Ryan, R., & Deci, E. (2017). *Self-determination theory: basic psychological needs in motivation, development, and wellness*. New York, New York: Guilford Publications.
- Saldana, J. (2009). *The coding manual for qualitative researchers*. London: Sage Publications Ltd.
- Swan, K., Van't Hooft, M., Kratcoski, A., & Schenker, J. (2007). Ubiquitous computing and changing pedagogical possibilities: Representations, conceptualisations and uses of knowledge. *Journal of Educational Computing Research*, 36(4), 481-515.
- Twining, P., Heller, R. S., Nussbaum, M., & Tsai, C. C. (2017). Some guidance on conducting and reporting qualitative studies. *Computers and Education*, 106, A1-A9.
- Varier, D., Dumke, E. K., Abrams, L. M., Conklin, S. B., Barnes, J. S., & Hoover, N. R. (2017). Potential of one-to-one technologies in the classroom: teachers and students weigh in. *Educational Technology Research and Development*, 65(4), 967-992.
- Yüksel, P., & Yıldırım, S. (2015). Theoretical Frameworks, Methods, and Procedures for Conducting Phenomenological Studies in Educational Settings. *Turkish Online Journal of Qualitative Inquiry*, 6(1), 1-20. doi: 10.17569/tojqi.59813
- Zheng, B., Warschauer, M., Lin, C., & Chang, C. (2016). Learning in one-to-one laptop environments: A meta-analysis and research synthesis. *Review of Educational Research*, 86(4), 1052–1084.