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Supporting students' motivation for e-learning: Teachers matter *on* and *off*line

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ABSTRACT

In e-learning environments that are characterized by minimal peer and teacher regulation, motivation is particularly critical but poorly understood. Students' prior experience with computers and smartphones, as well as the teacher support they receive during in-class instruction (in blended learning scenarios), are essential components of the e-learning experience that must be accounted for when seeking to explain students' motivation and learning outcomes in these contexts. This study therefore aimed to test the longitudinal effects of teacher support, prior subject competence, and prior experience with computers and smartphones, on student motivation for e-learning and finally e-learning completion. Employing five data points collected over one academic year, first-year Japanese university students (n = 975) studying English as a foreign language completed surveys at three time points. Cross-lagged panel structural equation modelling was undertaken with the finalized latent variables, prior subject competency (standardized test), and year-end e-learning completion rates. Perceived teacher support was found to have a broad range of direct and mediated effects on students' motivations for e-learning. Effort beliefs were consistent predictors of task value and ability beliefs after accounting for auto-lagged effects. E-learning completion was chiefly predicted by ability beliefs. The practical and theoretical implications for e-learning are discussed.

1. Introduction

Learning is a complex endeavour that necessitates a synergy of sustained cognitive, behavioural, and affective engagement (Reeve, 2012). Although a variety of factors influence learning outcomes, few are as important as time on task (Van Gog, 2013). This is true across most academic disciplines, but it is acutely felt in the domain of foreign language education (Fredrick & Walberg, 1980). The difficulty of time on task for this domain arises primarily from a scarcity of opportunities for exposure to the target language (i.e. few native speakers available; Fryer, Ozono, Carter, Nakao, & Anderson, 2013). This is a reality for students learning English as a foreign language within formal education across a considerable portion of the world. In such contexts, educators are obligated to employ every available resource to ensure sufficient exposure to learning materials. In many cases this means assigning online e-learning in addition to more traditional pen and paper independent study tasks. E-learning, as well as being relatively inexpensive and increasingly easy to access, allows students to engage with audiovisual materials that may otherwise be unavailable. These useful characteristics have made e-learning increasingly attractive to foreign language programmes at universities internationally.

As with other forms of independent study, the successful introduction of e-learning into a curriculum is contingent upon the students engaging with it in a meaningful way. In a previous study, Fryer, Bovee, and Nakao (2014) sought to address the issue of low e-learning completion rates. The e-learning under investigation was a mandatory component of a compulsory English language course (i.e. students could not graduate without having completed the course). The critical questions were less about why students were motivated to engage with it than about why they were not — a seemingly contradictory motivational response to an explicitly required task. This person-centred, longitudinal study found that lack of task value and ability were key areas of concern. Furthermore, the study revealed that students who began with critical deficits were unlikely to improve over the course of an academic year of e-learning study. Seeking to address these results, we designed a longitudinal cross-panel study to investigate factors that may ameliorate students' motivational deficits. It was also important to understand the longitudinal cross and auto-lagged relationships between different motivational deficits. Finally, modelling students' actual e-learning persistence as a concrete outcome was essential to ascertain the relative impact of the different motivational deficits under investigation.

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1.1. Blended learning in compulsory education

Online technologies have rarely proven powerful enough to effectively replace the personal guidance provided by a face-to-face teacher (Nielson, 2011); technology-based learning tools appear to best serve their purpose when the pedagogical approach includes an element of face-to-face instruction in a blended learning format (Cheung & Slavin, 2012; Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011; Means, Toyama, Murphy, & Bakia, 2013). Teachers of blended courses must often contend with concomitant motivational issues that hinder the integration of unfamiliar educational approaches. Such issues become more pronounced in compulsory educational contexts, where students must overcome a number of affective and technological barriers in order to successfully engage with online homework. By definition, such students lack the autonomy to select their own courses – a fact which imposes large motivational deficits even before the students set foot in their first class. Prior research has shown that students who were amotivated to engage with compulsory online homework became even more amotivated over a four-month period due to low task valuation and ability beliefs (Fryer, Bovee, et al., 2014). These types of motivational problems are not specific to online study; they are endemic to compulsory education in a range of contexts (e.g., Fryer et al., 2013; Fryer, 2013; and more broadly see Hidi & Harackiewicz, 2000). However, the common perception that online homework is somehow fundamentally different from traditional pen-and-paper homework appears to situate it in a separate mental category in terms of pedagogical importance and personal responsibility. It is therefore important to understand how such motivational deficits develop and how they might be ameliorated, specifically as they relate to compulsory online learning contexts.

1.2. Online learning in second language education

1.2.1. Increasing time on task

Language acquisition is a notoriously time-intensive endeavour. For many European languages, it is estimated to take at least 360 h of study to progress from a total beginner level to B1 (threshold intermediate) based on the Common European Framework of Reference (B1 is the third out of six proficiency levels in the CEFR, signifying an ability to confidently hold a conversation on everyday topics; Castella, 2013). This 360 hour investment represents a baseline time-on-task that cannot be significantly shortened through the application of more efficient learning techniques.

Moreover, time-on-task alone is insufficient for successful acquisition; exposure to the target language must be frequent in order to support proceduralization and automatization (DeKeyser, 2007). Closely spaced intensive study sessions across a week of study are therefore more optimal for learning than those separated by larger intervals, particularly for lower-level learners (Serrano, 2011). At minimum, online study completed between classes in a blended format can help decrease the intervals between study sessions and increase the total number of hours that students spend engaged in learning the language. Automated e-learning that instantly provides feedback to the learner particularly lends itself to the memorization of basic linguistic elements that learners must acquire at the earliest stages.

In compulsory curricula that take a blended approach, we believe that drill-and-practice e-learning can be instrumental, ensuring that all students acquire and operationalize foundational knowledge. This is chiefly due to the considerable time commitment necessary for substantive language learning to occur — a commitment that even highly self-regulated students can find difficult to maintain outside the classroom. In addition to this expansion of time-on-task, e-learning based drills, relative to pen-and-paper, offer enhanced opportunities for students to engage with carefully structured tasks that integrate multiple language skills (reading, listening and listening). However, despite the benefits of such an approach to e-learning, there are potential motivational costs. These costs and their potential amelioration are addressed by the current study.

1.2.2. Integration into a compulsory curriculum

In order for language acquisition e-learning to be successfully integrated into a compulsory curriculum, it must take into account the motivational characteristics of the learners. Automated e-learning, as a solitary undertaking, is no different from traditional homework. Immediate external influences, such as the teacher and classmates, are not physically present when completing homework, a fact that makes engagement and learning all the more difficult for students with significant motivational deficits. In our experience, we have found that the key factors to motivating students to engage with e-learning are, 1) to directly connect the e-learning to other homework and to in-class activities, and 2) to hold students accountable for their work. We have attempted to achieve this by designing a curriculum that ties together classroom instruction, traditional pen-and-paper homework, and e-learning into a unified whole, one that students are held accountable for on a weekly basis to ensure regularly spaced study intervals.

1.3. Prior computer and smartphone competency

As the current study involves students at a Japanese university, it is important to consider how technology usage patterns of Japanese youth may influence motivation to use e-learning in a formal educational context. Japan remains one of the most technologically advanced nations in the world that ranks highly in literacy, numeracy, and problem solving skills (OECD, 2015a). The nation ranks sixth in the world for the number of households with Internet access (87%). Yet in spite of these facts, Japan ranks last amongst OECD nations when it comes to youth having a command of basic ICT skills. Nearly a quarter of Japanese youth aged 16 to 29 lack basic computer literacy; the OECD average stands at under 10% (OECD, 2015a). At school, Japanese students were found to use computers for drilling language or mathematics the least amongst the OECD nations (OECD, 2014).

It may be tempting to assume that mobile devices have filled this technological gap. A 2014 survey found that some 90% of first-year high school students owned smartphones. These were used an average of two hours a day on weekdays and three hours a day on weekends (Benesse Corporation, 2014). As might be expected, mobile Internet is ubiquitous in Japan, with the nation second only to Finland in its number of wireless broadband subscriptions (OECD, 2015b). However, smartphones have only partially replaced computers in terms of acquiring fundamental ICT skills such as proficiency in productivity software, Internet skills, and file manipulation. Youth are reportedly using their smartphones primarily for email, social media, and games. Thirty-eight percent of high school students reported habitually using messaging apps while completing homework (Benesse Corporation, 2014), and the average smartphone user in Japan was found to regularly use fewer than eight dedicated software applications, one of the lowest in the OECD (OECD, 2014). These statistics suggest that although smartphones are used extensively in Japan, they have supplanted computers only for a narrow range of functionality such as email and social media.

1.4. The role of teachers

The part teachers play within education changes with the needs and constraints of the learning environment. Their fundamental role in instructing and supporting students, however, remains consistent across contexts. Discussion regarding how these two fundamental aspects of teaching might be done best goes back at least as far as Socrates. The comparatively young field of educational psychology has approached these components of teaching from many perspectives. From the perspective of student motivation, autonomy-support focused researchers (e.g., Reeve, 2009; Reeve, Bolt, & Cai, 1999; Reeve, Jang, Hardre, & Omura, 2002; Sierens, Vansteenkiste, Goossens, Soenens, &

Dochy, 2009) have employed a useful model of these fundamental elements of teaching. Working within Self-Determination Theory (Deci & Ryan, 1985), researchers in this area highlight importance of both autonomy support and structure for adaptive learning and quality outcomes (Jang, Reeve, & Deci, 2010). While the focus of this research has been on autonomy, researchers working within this field have also noted the essential role of teachers in supporting students' understanding of the *relevance* of their studies (Assor, Kaplan, & Roth, 2002). The relevance or task value of learning plays a major role within major psychological theories such as Expectancy Value Theory (EVT; Wigfield & Eccles, 2002) and SDT. Well-known theorists such as Brophy (2008) and Lens (Phalet, Andriessen, & Lens, 2004) have stressed the importance of value for learning. Brophy in particular, has strongly suggested teachers should play a large role in ensuring students understand the value of what is being taught. Recent empirical research in the context of Japanese higher education has demonstrated the role of value for essential elements such as depth of processing and future interest in a domain of study (Fryer, Van den Broeck, Ginns, & Nakao, 2016; Fryer, 2015; Fryer, Ginns, & Walker, 2014).

A number of studies have demonstrated the important role played by the teacher in facilitating online learning, such as supporting technological efficacy (Sawang, Newton, & Jamieson, 2013), facilitating content comprehension (Sloan, Porter, Robins, & McCourt, 2014), fostering engagement in collaborative learning (Lambropoulos, Faulkner, & Culwin, 2012), and overcoming technological limitations (Jordan, 2013). While it is clear that teachers are able to play a supportive role, studies have yet to examine the teacher's effect on student motivation in compulsory learning contexts, specifically where the e-learning component is fully automated.

In the case of automated e-learning, the structure component of learning is almost entirely managed by the software. When properly designed, e-learning environments themselves can play a role in supporting students' motivations. For example, appropriate or adaptive levelling of content, in addition to design aspects integral to the e-learning system, can support motivation to learn through fostering self-efficacy, intrinsic motivation, interest, and other elements (Keller, 2008). Supporting students' value for the online learning, however, is more complex. This type of support is necessary before students even start and is then required consistently thereafter.

1.5. Motivational components of learning online

To understand student motivation in the relatively novel context of learning online, a theory of motivational change is necessary. Self-Determination Theory (SDT) employs a continuum for understanding the improvement and degradation of the quality of an individual's motivation. SDT's Organismic Integration Theory (for an indepth description see Ryan & Deci, 2000) models motivation across a continuum of regulation: lack of (amotivation), external (extrinsic motivation), and internal (intrinsic motivation). In the context of individual online learning directed towards review and evaluation of students' studies, the chief concern is that students' motivation degrades. In the current research context the assignment of e-learning is curriculum-wide and identical for all students. Its purpose is to ensure students have sufficiently learned the weekly vocabulary (40 words) through their independent and classroom studies. It is also designed to assess whether students still have satisfactory knowledge of the previous weeks' assignments. The online learning is therefore externally regulated, which, based on SDT's continuum, suggests that many students are likely to engage with e-learning assignments with chiefly extrinsic motivation. Without teachers' support for the value of the online learning, there is the chance that many students' motivation may begin degrade towards amotivation as their online learning lacks motivational regulation.

Substantial research has been undertaken by Vallerand and colleagues to model amotivation as a part of the Academic Motivation Scale (Vallerand & Bissonnette, 1992; Vallerand et al., 1992, 1993). The dimensions of amotivation have also been examined in the context of environmental conscientiousness (Pelletier, Dion, Tucson, & Green-Demers, 1999) and well-being in high school (Legault, Green-Demers, & Pelletier, 2006). Legault et al. (2006) constructed and validated the Academic Amotivation Inventory, which assessed four dimensions of amotivation: effort, ability, task valuation, and task characteristics. These scales were adapted and piloted as a part of a study examining general learning within seven faculties at one Japanese university (Fryer, 2013), and only effort, ability, and task valuation were found to have sufficient divergent validity for meaningful modelling. In this initial study, these ability deficits and task value deficits proved to be important mediating variables for prior goals and future processing and GPA (Fryer, Ginns, et al., 2014). In the context of online learning, the ability, task valuation, and effort scales were successfully employed in a longitudinal person-centred study (Fryer, Bovee, et al., 2014). This study identified two distinct groups of e-learners: students who begin with critical deficits in ability beliefs, task valuation, and effort beliefs, and students who do not. Over time, students who do not experience deficits to a substantive degree generally remain unaffected. Students who start with critical deficits in these motivations, however, often develop significantly higher deficits in task value and ability beliefs. At the same time, this group of students' deficits in effort beliefs were observed to decrease. This suggests that while the e-learning was valued less and felt to be more difficult across the academic year, that students could acclimate to the time and effort demands of the weekly online learning.

1.6. The current study

Fryer, Bovee, et al. (2014) identified a significant issue for students who engage with learning who begin with substantial deficits in essential motivations. Their person-centred approach was, however, poorly situated to either explain the findings or offer potential solutions. To work towards such aims, a variable-centred longitudinal study that modelled both the development of students' motivational deficits and potential means of supporting student motivation while learning online was necessary.

To meet these objectives, the current study undertook an auto and cross-lag test of the effect of students' prior smartphone usage, computer usage, and perceived teacher support on their motivational deficits for learning in an online environment, six and twenty three weeks in the future. Prior computer use and teacher support were identified as potential predictors of future motivation for learning online. The growing ubiquity of smartphones raised questions about their role within students' online learning experiences.

In addition to computer/smartphone use and teacher support as key predictors, this study also examined the role of gender and prior competency on students' deficits in motivation for learning. Gender has a long history of relationships with motivation in academic contexts (Meece, Glienke, & Burg, 2006). In a wide range of contexts and at many developmental stages, female students are better motivated to succeed. It has been hypothesised that these adaptive motivations play a role within the gender differences observed in achievement at a broad range of levels (Voyer & Voyer, 2014). In addition to motivation, past research has suggested that male students are more likely to be regular computer users (Imhof, Vollmeyer, & Beierlein, 2007). This suggests that in the current study gender effects might therefore be partially mediated by past computer use.

2. Aims

In the current study we aimed to examine the role of teacher support, smartphone usage and computer usage on future deficits for learning online. The study therefore addressed five broad research questions,

1. What is the role teachers play in regards to the motivation students experience during e-learning that is connected to classroom learning?
2. Does past computer and/or smartphone competency have an effect on students' motivation for e-learning?
3. What are the cross-lagged effects of ability belief, task valuation, and effort beliefs over a seventeen-week period?
4. What effect does prior competency in the content under study have on e-learning motivation and completion?
5. What – if any – is the role of gender within students' prior experiences with computers and smartphones and classroom teacher support? What – if any – is the role of gender within students' online motivation for learning?

2.1. Hypotheses

Based on these broad research questions, nine hypotheses were constructed and tested. Students' prior competency in the English language was expected to enhance future motivation for studying online (Hypothesis 1). Students' prior competency was not expected to significantly predict their computer and smartphone usage, but it was expected to predict teacher support (Hypothesis 2). The predictive relationship between gender (female = 1, male = 2) and computer usage was expected to be positive (Hypothesis 3). Female students were expected to report less of all three motivational deficits (Hypothesis 4). Students' prior experience with computers was expected to negatively predict deficits in ability beliefs, but not significantly predict either task value or effort (Hypothesis 5). As the literature is not clear about the effect of smartphone usage on e-learning experiences, no clear predictive hypothesis could be constructed. Teacher support was expected to reduce deficits in motivation for e-learning broadly (Hypothesis 6). The auto-lagged predictive effect of prior on future motivation was expected to be strongly significant (Hypothesis 7). The cross-lagged predictive effects of prior on future motivation were expected to be significant but smaller than the auto-lagged predictive effects (Hypothesis 8). Motivational deficits were expected to predict lower e-learning completion rates at Time 5 (Hypothesis 9).

3. Methods

The current study was undertaken at one private mid-sized Japanese university in western Japan. All participating students ($n = 975$, female = 214) were in their first year at university and studying within one of seven faculties at the university. The gender and faculty balance was roughly equivalent with the general university population.

The e-learning experiences under investigation in the current research were a core component of the university's two-year English language programme. All students must complete the programme to graduate. Prior to entering the programme all students sat a standardized English language competency test (scored 0–180; see Stewart, Gibson, & Fryer, 2012) and were then grouped in classes based on their level. The English language programme consisted of two classes a week with two different teachers. The e-learning study examined in the current research was a vocabulary review component meant to support students in class (see Fryer, Anderson, Stewart, Bovee, & Gibson, 2010) and independent study (see Bovee, 2012). It was divided into 20 components, which were spread evenly across 20 weeks of the year-long English language course (30 weeks in length; 15 weeks each semester). During an orientation to the course at the beginning of the year students were informed of the e-learning and the measurement of students' experiences. At this stage students were informed that the surveys were in no way related to their grades and were given the opportunity to opt out of participating in the research. Six students chose not to participate and were excluded from the current study.

Two surveys were used in the current study. All surveys employed a 7-point (0 to 6) Likert scale, ranging from totally unlike me to totally matches me. The first survey (Time 2) assessed students' computer (four items: e.g., I am accustomed to using a computer.) and smartphone usage (four items: e.g., I often use a smartphone for things other than phone calls and emails.), as well as the amount of teacher support students perceived themselves as receiving (four items: e.g., My teacher clearly explained the importance of the assigned e-learning). Each scale had four items and were all worded positively. At Times 3 and 4 the students completed a survey with three scales (four items each; Stem, "I don't want to do my e-learning because") measuring students' deficits in ability beliefs (e.g., the e-learning activities were beyond my ability.), task valuation (I don't think there is a good enough reason to do it.) and effort beliefs (e.g., it would take too much effort.) regarding the online study. The scales were taken from the Academic Amotivation Inventory (Legault et al., 2006). The scales were also consistent with past (Fryer, Bovee, et al., 2014; Fryer, Ginns, et al., 2014) and current work in the field of motivational deficits in educational contexts (Fryer, Ginns, & Walker, under review). The scales are presented in full in the Appendix.

Participating students completed surveys regarding prior experiences with computers and smartphones and their perceptions of teacher support for the online learning after two weeks of classes (Time 2). After the first six weeks of e-learning students completed the first survey of students' motivational deficits (Time 3). Seventeen weeks after the first motivation survey, and prior to completing the final e-learning component, students completed the same survey again (Time 4). At the end of the year, students received an e-learning grade (Time 5). The grade was out of 100 and indicated the amount of the e-learning activities students had successfully completed during the term. Fig. 1 presents a detailed timeline of the study's sequence of instrument applications.

3.1. Analyses

All descriptive analyses were conducted using JMP 9.0 (SAS, 2007–2011). All structural equation modelling was undertaken using Maximum Likelihood Robust (MLR) within M*plus* 7.1 (Muthén & Muthén, 1998-2013). MLR is robust to Likert data with four or more categories (Muthén & Muthén, 1998-2013). Missing data at each time point never exceeded 7% and was handled by Full Information Maximum-Likelihood. The nested nature of students (students within 80 different classes) and therefore non-independence of scores was accounted for by treating class as a clustering variable (M*plus* cluster option; Muthén & Muthén, 1998-2013).

Modelling in the current student began with a configural test of the convergent and divergent validity of all latent and constructs employed in the study. The configural test was followed by a test of invariance for the longitudinal variables. For this test of invariance, comparisons of CFI and RMSEA (Time-1 and Time-2) were relied upon to assess the adequacy of the invariance between the two time points (Marsh, Nagengast, & Morin, 2013). Under this approach to invariance testing, the assumption of invariance is tenable if CFI does not change more than .01 and the RMSEA increases by less than .015 for the invariant model (Chen, 2007). Following the configural and invariance tests, the longitudinal model was examined.

Fit for modelling was assessed employing Root Mean Square Error of Approximation (RMSEA) (Browne & Cudeck, 1992), with values <.08 and <.05 held to indicate acceptable and good fit respectively, and the Confirmatory Fit Index (CFI) and Tucker–Lewis Index (TLI) (e.g., Marsh, Balla, & McDonald, 1988) with values >.90 and >.95 held to indicate acceptable and good fit respectively.

For the current study the interpretation of structural equation modelling results β coefficient results were relied on. The conversion of β coefficients was undertaken based on Peterson and Brown's (2005) recommendations, in line with Hattie's (2009) guidelines for

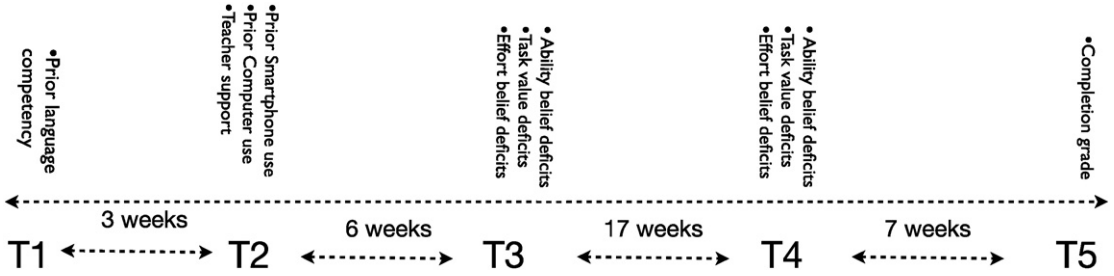

Fig. 1. Timeline for all measures employed in the current study.

educational effect sizes. The current study employed three levels of β weights for describing the effect of independent on dependent variables. For positive effects, a small $\beta = .05$; a moderate $\beta = .15$; and a large $\beta = .24$ and above. For negative effects, a small $\beta = -.10$; a moderate $\beta = -.20$; and a large $\beta = -.29$ and above.

In the current research the predictive effect of prior use and teacher support on motivational deficits for online learning were tested after a lag of 6 weeks and, after accounting for prior motivations, 23 weeks. Time two (usage and support) and Time four motivations were modelled as predicting completion of the students' assigned e-learning activities. Fig. 2 presents the model tested in the current study.

4. Results

4.1. Descriptive statistics

The reliability of all scales used in the current study was above acceptable benchmarks (>.70; Devellis, 2012). The means for both reported prior computer (3.86) and smartphone (3.08) usage were low, with average smartphone usage lower than the scales mid-point (3.5). The high standard deviation for smart phone usage can be attributed to some students not having one and therefore marking zero for all items. Students upon average reported themselves as receiving some support (4.14). Upon average students reported themselves as experiencing significantly less deficits in both ability (Time 3 = 2.80, Time 4 = 2.62; $t = -4.89$ (974), $p < .0001$) and effort (Time 3 = 3.60, Time 4 = 3.45; $t = -3.54$ (974), $p < .0004$) for studying online. Students' value for the online task, however, remained fairly constant (Time 3 = 2.78, Time 4 = 2.81; $t = 1.37$ (974), $p < .17$). In summary, mean-based results indicated that deficits in students' motivations for learning online generally improved over the course the year-long study.

Reflecting the small grade percentage (10%) attributed to the online review component the average completion was quite low (21.40). The higher standard deviation can be attributed to some students not getting beyond the first section of the e-learning during the second semester.

4.2. Correlational results

Correlations were estimated with latent variables within M*plus* (see Table 1). Gender (female = 1, male = 2) exhibited five small significant correlations. Correlations suggested that girls were more competent to start, perceived themselves as having more prior experience with computers and were less likely to experience motivational deficits than male students.

Prior competence exhibited moderate and small correlations with Time-3 ability beliefs ($r = -.25$, $p < .01$) and Time-4 ability beliefs ($r = -.18$, $p < .01$). Experience using computers exhibited five significant correlations. Using computers had a significant moderate positive correlation with perceived teacher support ($r = .36$, $p < .01$), small negative correlations with ability beliefs and task valuation at Time-3 ($r = -.19$ and $-.17$, $p < .01$) and ability beliefs at Time-4 ($r = -.13$, $p < .01$). Computer use also had a significant small positive correlation with students' e-learning completion grade ($r = .10$, $p < .01$). Correlational results therefore suggest that both prior competence and computer use are related to fewer motivational issues and, in the case of computer use, e-learning achievement.

Perceived teacher support for students' online studies exhibited significant negative correlations with all motivational deficits modelled. Teacher's support was clearly related to students experiencing fewer motivational deficits; this suggests that this support might be having its intended effect.

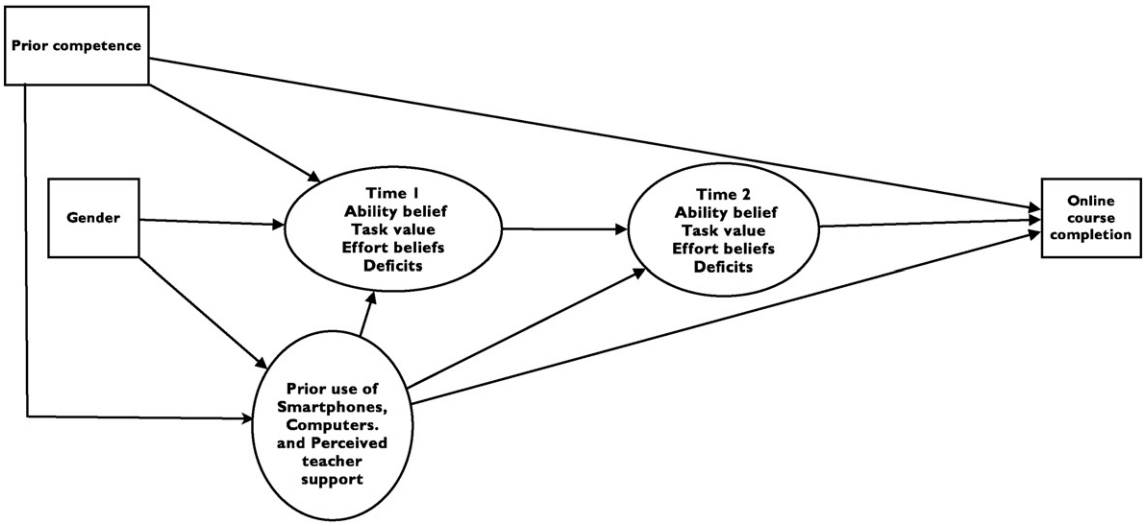

Fig. 2. Hypothesised model.

Table 1
Correlation matrix and descriptive statistics for all variables modelled.

		1	2	3	4	5	6	7	8	9	10	11	12
1	F_M	1.00											
2	Prior competence	−.14**	1.00										
3	Computers	−.17**	.09	1.00									
4	Teacher support	−.01	.01	.36**	1.00								
5	Smartphone	−.01	−.02	.07	.09*	1.00							
6	Ability beliefs T3	.12**	−.25**	−.19**	−.14**	.06	1.00						
7	Task valuation T3	.08*	−.01	−.17**	−.26**	.07	.72**	1.00					
8	Effort beliefs T3	−.01	.05	−.07	−.18**	.03	.64**	.75**	1.00				
9	Ability beliefs T4	.09*	−.18**	−.13**	−.14**	−.01	.51**	.30**	.35**	1.00			
10	Task valuation T4	.01	.01	−.07	−.23**	−.07	.32**	.49**	.46**	.71**	1.00		
11	Effort beliefs T4	−.03	.04	−.01	−.19**	−.05	.30**	.40**	.57**	.61**	.75**	1.00	
12	E-learning completion	−.02	.06	.10*	.09*	.05	−.33**	−.27**	−.34**	−.74**	−.66**	−.61**	1.00
	Mean		92.44	3.86	4.14	3.08	2.80	2.78	3.6	2.62	2.81	3.45	21.4
	Standard deviation		14.08	1.06	1.04	1.96	1.13	1.09	1.22	1.15	1.21	1.35	31.6
	Cronbach's alpha			.81	.80	.95	.85	.88	.88				

* $p < .05$.
** $p < .01$.

Correlational results across to Time-3 and Time-4 demonstrated the strong intercorrelation between the three motivational deficits, which was expected given their theoretical connection (Legault et al., 2006). Consistently strong relationships with students' e-learning completion indicated that these deficits were connected to students failing to complete the weekly e-learning tasks.

4.3. Structural equation modelling

Prior to longitudinal modelling, all variables were included in a confirmatory factor analysis to assess their convergent and divergent validity, as well as their overall fit together. Confirmatory factor analysis resulted in a good fit: $\chi^2 = 1378.199$ (704), CFI = .945, TLI = .96 and RMSEA = .031 (C.I. 90% = .029–.034). Invariance testing for Time 3 and 4 variables resulted in fit which met the guidelines for longitudinal invariance (Chen, 2007), suggesting invariance for the Time 3 and 4 variables was tenable: CFI = .944 and RMSEA = .031 (C.I. 90% = .029–.034).

The longitudinal model (Fig. 3) was then tested and was found to fit the data well: $\chi^2 = 1418.750$ (714), CFI = .95, TLI = .95 and RMSEA = .03 (C.I. 90% = .030–.035).

Modelling results (Fig. 3) indicated that prior competency negatively predicted ($\beta = -.26$, $p < .05$) Time-3 ability beliefs (Hypothesis 1), but failed to predict any other Time-2 or Time-3 variable (Hypothesis 2). Gender (female = 1, male = 2) predicted computer usage with a small negative effect ($\beta = -.16$, $p < .01$; Hypothesis 3). Gender also

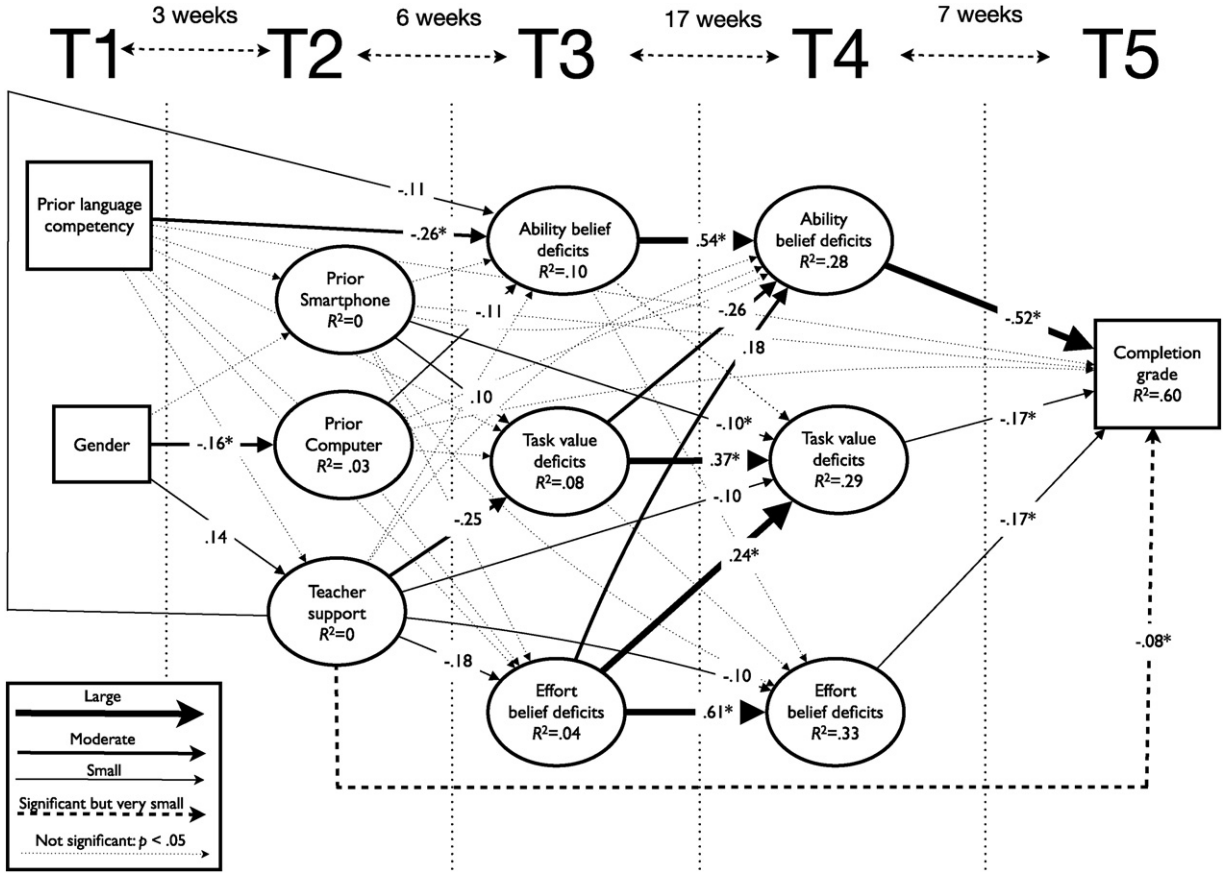

Fig. 3. Longitudinal structural model of motivational deficits for e-learning studies.

positively predicted teacher support ($\beta = .14$, $p < .05$) but failed to significantly predict smartphone use. Gender did not predict motivational deficits at Time-3 (Hypothesis 4). Prior computer use significantly predicted Time-3 ability belief deficits ($\beta = .14$, $p < .05$; Hypothesis 5). Despite the lack of clear hypothesis, prior smartphone use negatively (Time-3; $\beta = -.10$, $p < .05$) and then positively predicted (Time-4; $\beta = .10$, $p < .05$) task valuation deficits. Teacher support negatively predicted all motivational deficits at Time-3 (ability beliefs $\beta = -.11$, $p < .01$; task valuation $\beta = .25$, $p < .05$; effort beliefs $\beta = -.18$, $p < .05$; Hypothesis 6). Teacher support also negatively predicted task valuation ($\beta = .54$, $p < .01$ and effort beliefs at Time-4. Teacher support also had a small negative effect on students' completion grade ($\beta = -.08$, $p < .05$).

The auto-lagged predictive effects of the motivational deficits at Time-3 to Time-4 (Hypothesis 7) were large (ability beliefs $\beta = .54$, $p < .01$; task valuation $\beta = .37$, $p < .01$; effort beliefs $\beta = .61$, $p < .01$). Ability beliefs at Time-3 had no significant cross-lagged predictive effects on future deficits at Time-4 (Hypothesis 8). Time-3 task valuation had a negative moderate effect on Time-4 ability beliefs ($\beta = -.26$, $p < .01$). Time-3 effort beliefs had a negative moderate effect on Time-4 ability beliefs ($\beta = .18$, $p < .05$) and a large positive effect on task valuation ($\beta = .24$, $p < .01$).

Each Time-4 motivational deficit had a significant predictive effect on students' e-learning completion grade (Hypothesis 9). Ability beliefs predicted e-learning grades with a large effect ($\beta = -.52$, $p < .01$). Task valuation had a small negative effect ($\beta = -.17$, $p < .01$). Effort belief had a small negative effect ($\beta = -.17$, $p < .01$).

Accounting for prior competency and gender, the variance explained for prior smartphone ($R^2 = 0$) and computer ($R^2 = .03$) experience, as well as teacher support ($R^2 = .03$) was very low. Time-3 ability beliefs ($R^2 = .10$), task-value ($R^2 = .08$) and effort beliefs ($R^2 = .04$) also had a relatively small amount of their variance explained. At Time-4, accounting for auto-lagged relationships, ability beliefs ($R^2 = .28$), task-value ($R^2 = .29$) and effort beliefs ($R^2 = .33$) had substantially more variance explained. E-learning completion had a substantial amount of variance explained by the model ($R^2 = .60$).

5. Discussion

The current study aimed to test the longitudinal role of 1) perceived teacher support, and 2) prior experience with computers and smartphones, as it relates to students' motivations for engaging with weekly e-learning assignments. In addition, modelling estimated the auto/cross-lagged interaction between students' motivation over time. Finally, the model was fully-forward (all prior variables were modelled as predicting all future variables), accounting for prior competency and predicting e-learning as its observable outcome. This test was undertaken within a cross-lagged model across one academic year.

Model results indicated that, consistent with its nature, prior language competency moderately predicted ability beliefs, but was not a significant factor within future task-value or effort beliefs (Hypothesis 1). Prior competency was also not a significant predictor of prior smartphone experience, prior computer experience, or teacher support (Hypothesis 2).

Gender (female = 1, male = 2) had the opposite of the hypothesised effect (Imhof et al., 2007) on prior computer experience, with male students reporting less experience with computers than female students (Hypothesis 3). Unexpectedly, gender had a small positive effect on teacher support, with female students experiencing less support than their male counterparts. After accounting for the effect of gender on smartphone/computer experience and perceptions of teacher support, gender did not have a significant effect on students' future motivation (Hypothesis 4). This suggests that the role gender was expected to play within student motivation (Voyer & Voyer, 2014), may have been mediated through prior experiences and teacher support.

Consistent with expectations (Hypothesis 5), prior computer experience predicted future ability beliefs, but failed to significantly predict both task-value and effort belief. No clear hypothesis regarding prior smartphone experience was constructed due to a lack of research in this area. At Time-3, smartphone experience positively predicted lack of task value. However, a small predictive negative effect was observed at Time-4. These results suggest that after accounting for prior motivational deficits, prior smartphone experience has a small positive effect on students' value for e-learning tasks. Although the effects on motivations were small for both computer and smartphone experience, it is important to recognize that these effects were generally beneficial. However, it may be unwise to assume that placing greater emphasis on computer literacy would automatically pay large dividends — at least in terms of student motivation to engage with e-learning. In addition, we must concede that the 16 h of weekly smartphone use logged by students (Benesse Corporation, 2014), though non-academic in nature, provides motivational benefits that are comparable in scale to those conferred by computer experience.

Consistent with expectations, teacher support exhibited a broad range of adaptive effects on future ability beliefs (Time-3), task-value (Time-3 and Time-4), and effort beliefs (Time-3 and Time-4). It is also important to point out the potential mediated effects of perceived teacher support on Time-4 ability beliefs (Hypothesis 6).

As expected, auto-lag effects between Time-3 and Time-4 were substantial (Hypothesis 7). Significant cross-lagged predictive effects (Time-3 to Time-4) were large (effort to value) and moderate (effort and value to ability) (Hypothesis 8). The large predictive negative effect from task value to ability beliefs (Time-3 to Time-4) contradicted our hypothesis. Students who do not value the e-learning tasks were less likely to report experiencing deficits in ability beliefs. Clearly, both a lack of effort beliefs (chiefly) and task value (to a lesser degree) have a broad range of deleterious effects on other important sources of motivation. Finally, as hypothesised (9), the proposed motivational deficit model strongly predicted e-learning completion at the end of the year. Results suggested that ability beliefs account for the largest portion of variance explained in e-learning completion, highlighting their particular importance.

In summation, rigorous longitudinal modelling, accounting for prior ability, demonstrates the broad range of effects in-class instruction can have on student motivation during online learning experiences. This modelling points to the long-term effect of effort beliefs, specifically in regards to the impairment of other motivations and ability beliefs, as a powerful reason for not completing assigned e-learning.

5.1. Theoretical implications

The theoretical implications of the current study are divided into three related sections. First, we review the importance of understanding why students do not want to engage with assigned work, specifically in the context of solitary e-learning. Next, we outline the implications of the cross-lagged effects observed between the three deficits modelled. Finally, the role of the teacher within e-learning contexts is discussed.

5.1.1. Understanding why students don't want to study

Educational researchers often forget that a substantial proportion of the learning students undertake (even at university) involves very little choice. In these compulsory learning contexts, we have argued for the importance of understanding why students' do not want to study. E-learning in the current research was undertaken alone and unregulated by peer and teacher interactions. We therefore hypothesised, based on past research (Fryer, Bovee, et al., 2014), that understanding why students "don't want to" is essential to understanding learning outcomes. The longitudinal results from this study support this hypothesis. After accounting for a range of important variables, the three motivational deficits modelled each had a meaningful predictive effect on e-learning completion at the end of the year.

Ability deficits had the largest predictive effect on e-learning completion, but an examination of the cross-lagged relationships suggests a complex background of mediated predictive effects. Within these, maladaptive effort beliefs are of considerable concern. Effort beliefs directly predicted deficits in both task value and ability beliefs. Students who were not prepared to put in the effort today were more likely to feel that "they can't do it" and "don't value it" in the future. This fundamental lack of energy for a learning task is of concern both for its broad effects and the complex issue of addressing it.

The one significant cross-lagged effect of task value raises theoretical questions about the relationship between ability belief and task value; this predictive relationship could, however, be idiosyncratic to the current discussion of deficits. Modelling indicated that after accounting for a range of prior variables and auto-lagged relationships, deficits in task value predicted fewer deficits in ability beliefs. One explanation for this predictive relationship could be that students who fail to value the e-learning, fail to carefully consider its difficulty. This could be a type of ego protection in which students think the e-learning is not worth their time and therefore fail to meaningfully engage with it: "who cares how hard it might be, it is simply not worth my time."

At the centre of this study's modelling stands the teacher's role and the benefits of a blended approach as highlighted by reviews of the literature (Cheung & Slavin, 2012; Tamim et al., 2011; Means et al., 2013). It is important to note that perceived teacher support was measured just after classes started in first semester. Task value, ability beliefs, and effort beliefs deficits were all (and in that order of importance) ameliorated by teacher support. The broad role of this support is further strengthened by the combination of potential mediated and direct effects after accounting for auto-lag relationships. As Assor et al. (2002) suggest, the teacher has substantial power to affect students' perceptions of the value of schoolwork, and thereby affect the quality of its outcomes. In addition to supporting this finding, the current results demonstrate that the benefits of explaining the relevance of schoolwork (Brophy, 1999, 2008) go beyond task value to effort and ability beliefs.

5.2. Practical implications

5.2.1. Supporting students on and offline

The effects of university instructors on student engagement and motivation in the classroom have been extensively researched; it is, after all, the most conspicuous aspect of the profession. However, when it comes to students' online learning experiences, the role of the instructor has yet to receive in-depth scrutiny. This is understandable given it is a relatively recent addition to the university learning experience. The results of this study have clear implications for instructors, supporting the importance of a blended learning approach (Cheung & Slavin, 2012; Tamim et al., 2011; Means et al., 2013) for student motivation during online learning. While prior research has demonstrated that, from the perspective of learning outcomes, a blended approach is far superior to both purely face-to-face and purely online approaches (Means et al., 2013), the current research demonstrates just how crucial the teacher's role is to the success of a blended approach. Teachers need to regularly take the time to clearly emphasize the relevance and meaningfulness of learning done both during class and online. Teachers should see this as being an essential part of their role in the classroom. This may sound simple, but there is a hitch: teachers often do not have much control over what they teach in situations where national, institutional, and departmental demands regularly guide course content. There is therefore a danger that teachers do not actually believe that the coursework is relevant. There are at least two means by which this issue might be addressed: 1) whenever possible, teachers need to feel like they are a part of the curricular decision-making processes, and 2) the parties invested with the responsibility of making the final decisions need to convince teachers of the value of curriculum content. For teachers to compellingly defend the relevance of what students need to do during self-study online, they need to believe it themselves. We believe that both bottom up and top down processes (with teachers at the centre) are important for supporting these essential teacher beliefs.

5.2.2. Effort beliefs online

Clearly the deficit of most concern modelled in the current study was effort. Unfortunately, it is also perhaps the most difficult to address. Further complicating the issue, extensive research on expectancy value theory has suggested the problem begins with students' beliefs regarding value and competency (e.g., Eccles et al., 1983). While not evident in the current study, the relationship between the beliefs is likely reciprocal. By shifting the focus to deficits in the current study and confronting the reasons why students do not want to study directly, we may have captured a different stage of this complex spiral of reciprocal relationships.

5.3. Limitations and future directions

The current study has a number of limiting factors. These limitations are important when both interpreting the presented findings and considering future directions. The current study was undertaken at one university within the context of one type of e-learning. It should also be noted that while this study accounted for prior competency and employed an observed outcome (completion of the assigned e-learning), this modelling relied chiefly on self-reported data. Finally, the cultural context of Japan could have played a role within the study's findings. All of these limitations play a role in the external validity of this research.

Future studies are called for at other institutions in Japan and internationally, in both language education and other domains of study. We hope that any such replications or extensions would be based on a similarly large sample, and employ a latent and longitudinal research design. This kind of future research would ensure meaningful comparison with the current study's findings.

6. Conclusions

Research has indicated that in e-learning environments, students who start with critical deficits in motivation generally further degrade over time (Fryer, Bovee, et al., 2014). Researchers working with learning technologies have consistently supported the benefits of a blended approach for incorporating these new learning spaces into formal education (for an overview of the current state of blended learning research, refer to: Halverson, Graham, Spring, Drysdale, & Henrie, 2014). The current study has demonstrated that teachers have the power (as well as the responsibility; Brophy, 1999, 2008; Phalet et al., 2004) to address a broad array of motivational deficits simply by clearly communicating to their students the importance of their e-learning assignments. Furthermore, evidence from the current study supports the importance of teachers' efforts during the first few weeks of the academic year. Strong support from the teacher in these critical first few weeks can have longstanding and substantial effects on the motivation students' experience. Clearly, teachers matter, both *off* and *on*line.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.iheduc.2016.03.003.

References

Assor, A., Kaplan, H., & Roth, G. (2002). Choice is good, but relevance is excellent: Autonomy-enhancing and suppressing teacher behaviours predicting students' engagement in schoolwork. *British Journal of Educational Psychology, 72*, 261–278.

Benesse Corporation (2014). Chu-ko-sei no ICT riyou jittai chousa 2014 houkokusho [Report: The current state of ICT use by middle and high school students 2014]. Retrieved from http://berd.benesse.jp/shotouchutou/research/detail1.php?id=4377

Bovee, N. (2012). KSU myWord no kaihatsu keika oyobi ALC PowerWords to no kanryou jyoukyou hikaku. *Language Education and Research Center Journal*, *7*, 95–99.

Brophy, J. (1999). Toward a model of the value aspects of motivation in education: Developing appreciation for particular learning domains and activities. *Educational Psychologist*, *34*, 75–85. http://dx.doi.org/10.1207/s15326985ep3402_1.

Brophy, J. (2008). Developing students' appreciation for what is taught in school. *Educational Psychologist*, *43*, 132–141. http://dx.doi.org/10.1080/00461520701756511.

Browne, M., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research*, *21*, 230–258. http://dx.doi.org/10.1177/0049124192021002005.

Castella, T. (2013). How many hours does it take to be fluent in English? *BBC news magazine* Retrieved from http://www.bbc.com/news/magazine-23407265

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural equation modeling*, *14*(3), 464–504.

Cheung, A., & Slavin, R. E. (2012). *The effectiveness of educational technology applications for enhancing reading achievement in K-12 classrooms: A meta-analysis.* Baltimore, MD: Johns Hopkins University, Center for Research and Reform in Education.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* New York: Plenum.

DeKeyser, R. M. (2007). Study abroad as foreign language practice. In R. M. DeKeyser (Ed.), *Practice in a second language: Perspectives from applied linguistics and cognitive psychology (pp. 208–226).* Cambridge University Press.

Devellis, R. F. (2012). *Scale Development: Theory and application* (3rd ed.). Thousand Oaks, CA: Sage.

Eccles, J., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motives: Psychological and sociological approaches* (pp. 75–146). San Francisco, CA: Freeman.

Fredrick, W. C., & Walberg, H. J. (1980). Learning as a function of time. *The Journal of Educational Research*, *73*, 183–194.

Fryer, L. K. (2013). *Motivated study and learning strategies: Cross-sectional and longitudinal investigations.* (Ph.D. Educational Psychology) Sydney University.

Fryer, L. K. (2015). Predicting self-concept, interest and achievement for first-year students: The seeds of lifelong learning. *Learning and Individual Differences*, 1–9. http://dx.doi.org/10.1016/j.lindif.2015.01.007.

Fryer, L. K., Bovee, H. N., & Nakao, K. (2014). E-learning: Reasons students in language learning courses don't want to. *Computers & Education*, *74*, 26–36. http://dx.doi.org/10.1016/j.compedu.2014.01.008.

Fryer, L. K., Ginns, P., & Walker, R. (2014). Between students' instrumental goals and how they learn: Goal content is the gap to mind. *British Journal of Educational Psychology*, *84*(4), 612–630. http://dx.doi.org/10.1111/bjep.12052.

Fryer, L. K., Ginns, P., & Walker, R. A. (2016). *Reciprocal modeling of students' regulationstrategies and motivational deficits for studying.* (under review).

Fryer, L. K., Van den Broeck, A., Ginns, P., & Nakao, K. (2016). Understanding students' instrumental goals, motivation deficits and achievement: Through the Lens of a Latent Profile Analysis. *Psychologica Belgica.*

Fryer, L. K., Anderson, C. J., Stewart, J., Bovee, H. N., & Gibson, A. (2010). *Coordinating a vocabulary curriculum: Exploration, pilot, trial and future directions.* Nagoya, Japan: Paper presented at the The Japan Association for Language Teaching National Conference.

Fryer, L. K., Ozono, S., Carter, P., Nakao, K., & Anderson, C. J. (2013). Instrumental reasons for studying in compulsory English courses: I didn't come to university to study English so why should I? *Innovation in Language Learning and Teaching*, *00*(00), 1–18. http://dx.doi.org/10.1080/17501229.2013.835314.

Halverson, L. R., Graham, C. R., Spring, K. J., Drysdale, J. S., & Henrie, C. R. (2014). A thematic analysis of the most highly cited scholarship in the first decade of blended learning research. *Internet and Higher Education*, *20*, 20–34.

Hattie, J. C. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement.* London & New York: Routledge, Taylor & Francis.

Hidi, S., & Harackiewicz, J. (2000). Motivating the academically unmotivated: A critical issue for the 21st century. *Review of Educational Research*, *70*, 151–179.

Imhof, M., Vollmeyer, R., & Beierlein, C. (2007). Computer use and the gender gap: The issue of access, use, motivation, and performance. *Computers in Human Behavior*, *23*(6), 2823–2837. http://dx.doi.org/10.1016/j.chb.2006.05.007.

Jang, H., Reeve, J., & Deci, E. L. (2010). Engaging students in learning activities: It is not autonomy support or structure but autonomy support and structure. *Journal of Educational Psychology*, *102*, 588–600. http://dx.doi.org/10.1037/a0019682.

Jordan, C. (2013). Comparison of International Baccalaureate (IB) chemistry students' preferred vs actual experience with a constructivist style of learning in a Moodle e-learning environment. *International Journal for Lesson and Learning Studies*, *2*(2), 155–167.

Keller, J. M. (2008). First principles of motivation to learn and e3-learning. *Distance Education*, *29*(2), 175–185. http://dx.doi.org/10.1080/01587910802154970.

Lambropoulos, N., Faulkner, X., & Culwin, F. (2012). Supporting social awareness in collaborative e-learning. *British Journal of Educational Technology*, *43*(2), 295–306.

Legault, L., Green-Demers, I., & Pelletier, L. (2006). Why do high school students lack motivation in the classroom? Toward an understanding of academic amotivation and the role of social support. *Journal of Educational Psychology*, *98*, 567–582. http://dx.doi.org/10.1037/0022-0663.98.3.567.

Marsh, H. W., Balla, J. R., & McDonald, R. P. (1988). Goodness-of-fit indexes in confirmatory factor-analysis: The effect of sample-size. *Psychological Bulletin*, *103*, 391–410. http://dx.doi.org/10.1037//0033-2909.103.3.391.

Marsh, H. W., Nagengast, B., & Morin, A. J. S. (2013). Measurement invariance of big-five factors over the life span: ESEM tests of gender, age, plasticity, maturity, and la dolce vita effects. *Developmental Psychology*, *49*(6), 1194. http://dx.doi.org/10.1037/a0026913.

Means, B., Toyama, Y., Murphy, R., & Bakia, M. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. *Teachers College Record*, *115*(3).

Meece, J. L., Glienke, B. B., & Burg, S. (2006). Gender and motivation. *Journal of School Psychology*, *44*, 351–373. http://dx.doi.org/10.1016/j.jsp.2006.04.004.

Muthén, L. K., & Muthén, B. O. (1998-2013). *Mplus user's guide* (6th ed.). Los Angeles, CA: Muthén & Muthén.

Nielson, K. B. (2011). Self-study with language learning software in the workplace. *Language Learning & Technology*, *15*, 100–129.

Organization for Economic Cooperation and Development (2014). *Measuring the digital economy: A new perspective.* OECD Publishing http://dx.doi.org/10.1787/9789264221796-en.

Organization for Economic Cooperation and Development (2015a). *Skills outlook 2015: Youth, skills and employability.* OECD Publishing http://dx.doi.org/10.1787/9789264234178-en.

Organization for Economic Cooperation and Development (2015b). *OECD Broadband Statistics Update.* Retrieved from http://www.oecd.org/sti/broadband/broadband-statistics-update.htm

Pelletier, L. G., Dion, S., Tucson, K., & Green-Demers, I. (1999). Why do people fail to adopt environmental behaviors? Toward a taxonomy of environmental amotivation. *Journal of Basic and Applied Social Psychology*, *29*, 2481–2504. http://dx.doi.org/10.1111/j.1559-1816.1999.tb00122.x.

Peterson, R. A., & Brown, S. P. (2005). On the use of beta coefficients in meta-analysis. *Journal of Applied Psychology*, *90*, 175–181. http://dx.doi.org/10.1037/0021-9010.90.1.175.

Phalet, K., Andriessen, I., & Lens, W. (2004). How future goals enhance motivation and learning in multicultural classrooms. *Educational Psychology Review*, *16*, 59–89. http://dx.doi.org/10.1023/B:EDPR.0000012345.71645.d4.

Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. *Educational Psychologist*, *44*, 159–175. http://dx.doi.org/10.1080/00461520903028990.

Reeve, J. (2012). A self-determination theory perspective on student engagement. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 149–172). Springer US.

Reeve, J., Bolt, E., & Cai, Y. (1999). Autonomy-supportive teachers: How they teach and motivate students. *Journal of Educational Psychology*, *91*, 537–548. http://dx.doi.org/10.1037/0022-0663.91.3.537.

Reeve, J., Jang, H., Hardre, P., & Omura, M. (2002). Providing a rationale in an autonomy-supportive way as a strategy to motivate others during an uninteresting activity. *Motivation and Emotion*, *26*, 183–207. http://dx.doi.org/10.1023/a:1021711629417.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*, 54–67. http://dx.doi.org/10.1006/ceps.1999.1020.

SAS. (2007–2011). JMP Version 9.01. Cary, NC: SAS Institute.

Sawang, S., Newton, C., & Jamieson, K. (2013). Increasing learners' satisfaction/intention to adopt more e-learning. *Education + Training*, *55*(1), 83–105.

Serrano, R. (2011). The time factor in EFL classroom practice. *Language Learning*, *61*, 117–145.

Sierens, E., Vansteenkiste, M., Goossens, L., Soenens, B., & Dochy, F. (2009). The synergistic relationship of perceived autonomy support and structure in the prediction of self-regulated learning. *British Journal of Educational Psychology*, *79*, 57–68. http://dx.doi.org/10.1348/000709908x304398.

Sloan, D., Porter, E., Robins, K., & McCourt, K. (2014). Using e-learning to support international students' dissertation preparation. *Education + Training*, *56*(2/3), 122–140.

Stewart, J., Gibson, A., & Fryer, L. K. (2012). Examining the reliability of a TOEIC Bridge practice test under 1 and 3 parameter item response models. *Shiken Research Bulletin*, *16*.

Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and validation study. *Review of Educational Research*, *81*, 4–28.

Vallerand, R. J., & Bissonnette, R. (1992). Intrinsic, extrinsic, and amotivational styles as predictors of behavior: A predictor of behavior — A prospective study. *Journal of Personality*, *60*, 599–620.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Briere, N. M., Senecal, C., & Vallieres, E. F. (1992). The academic motivation scale: A measure of intrinsic, extrinsic and amotivation in education. *Educational and Psychological Measurement*, *52*, 1003–1017. http://dx.doi.org/10.1177/0013164492052004025.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Briere, N. M., Senecal, C., & Vallieres, E. F. (1993). On the assessment of intrinsic, extrinsic, and amotivation in education — Evidence on the concurrent and construct-validity of the academic motivation scale. *Educational and Psychological Measurement*, *53*, 159–172. http://dx.doi.org/10.1177/0013164493053001018.

Van Gog, T. (2013). Time on task. In J. Hattie, & E. M. Anderman (Eds.), *International guide to student achievement.* New York: Routlege.

Voyer, D., & Voyer, S. (2014). Gender differences in scholastic achievement: A meta-analysis. *Psychological Bulletin*, *4*, 1174–1204. http://dx.doi.org/10.1037/a0036620.

Wigfield, A., & Eccles, J. S. (2002). The development of competence beliefs, expectancies for success and achievement values from childhood through adolescence. *Development of achievement motivation* (pp. 1–32). San Diego: Academic Press.