



Exploring the roles of academic, personal, and cultural demands and resources in immigrant students' motivation, engagement, and achievement

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ABSTRACT

Background: The present investigation applied the academic and cultural demands-resources (ACD-R) framework to better understand the academic development of immigrant high school students.

Aims: Analyses sought to test the hypothesized contribution of academic demands (e.g., learning-disrupted teaching) and resources (e.g., autonomy-supportive teaching), personal demands (e.g., fear of failure) and resources (e.g., adaptability), and cultural demands (e.g., discrimination) and resources (e.g., cultural confidence) in predicting motivation (self-efficacy, valuing)—and, in turn, the extent to which motivation predicted academic outcomes in the forms of engagement (persistence, non-attendance) and performance (achievement).

Sample: Drawing on PISA (2018) data, the sample comprised 4886 immigrant students: 3329 from Australia and 1557 from New Zealand.

Method: Confirmatory factor analysis (CFA) was first conducted to ascertain the psychometric properties of the study's measures and then the central analyses employed structural equation modelling (SEM) to test hypothesized paths.

Results: After demonstrating good CFA fit, SEM revealed that particularly salient (at $p < 0.001$) demand and resource predictors of motivation were: warmth-supportive teaching (positively), fear of failure (negatively), adaptability (positively), discrimination (negatively), cultural communication skills (positively), and cultural confidence (positively). Also, self-efficacy and valuing significantly predicted persistence (positively) and non-attendance (negatively), while self-efficacy also significantly predicted achievement (positively).

Conclusions: The hypothesized ACD-R process is a viable means to understand immigrant students' academic experience and to offer some fruitful direction for supporting their academic development.

Many nations around the world have witnessed a steep rise in the size of their immigrant populations, including their immigrant student populations (Organisation for Economic Cooperation and Development [OECD], 2020). For example, in the past decade, Europe has faced the challenge of integrating substantial numbers of newly arrived migrants and refugees into its education systems (Eurostat, 2020). The U.S. now has more immigrants than any other nation in the world and whose children must be accommodated in its school systems (Budiman, 2020). In Australia (one of the sites of the present study), at least one-quarter of school students have English as a second language or dialect (Australian Curriculum, Assessment and Reporting Authority, 2022). How educators and education systems respond to this plays a big part in how

immigrant students adjust to and thrive at school (Bilgili, 2019).

Although there are many success stories, there continues to be large numbers of immigrant students who underachieve, leave school early, and lose critical post-school education opportunities (Cutmore et al., 2018). The importance of providing high-quality and equitable education for immigrant students is well recognized. If these students fall behind academically, they are at risk of not attaining the critical skills essential for successful functioning through life, including in post-school education, training, and work (OECD, 2006). According to OECD (2020), as societies become increasingly diverse, how welcoming host countries educate immigrant youth is of increasing importance (see also Oczlon et al., 2021; Schachner et al., 2019). If host nations and their

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education systems adopt exclusionary practices and attitudes towards immigrant students, the educational opportunities afforded to immigrants will be compromised. This underscores the need for research that identifies how to help immigrant students navigate the academic challenges facing them and at the same time support their academic outcomes by way of enhanced engagement and performance (OECD, 2006). The present study applied the “academic and cultural demands-resources” (ACD-R) framework (Martin & Collie, 2022; Martin et al., 2024; see Fig. 1) to investigate factors that may help immigrant students succeed at school. In this study, we use the term “cultural” (and on occasions, “ethno-cultural”) as an umbrella term to refer to individuals and

communities who are from an ethnic, religious and/or linguistic group which constitutes a proportion of a population whose members share common characteristics of culture, language, and/or religion (Office of the High Commissioner for Human Rights, 2024). Subsumed under that umbrella term are immigrants. Therefore, the study focuses on immigrant students as a particular case of cultural (or, ethno-cultural) diversity. The study harnessed the PISA (2018) data for immigrant students in Australia and New Zealand, two nations that have traditionally been “settlement countries”, receiving migrants to live, work, and raise their families (OECD, 2006). In PISA (2018), immigrant students are defined

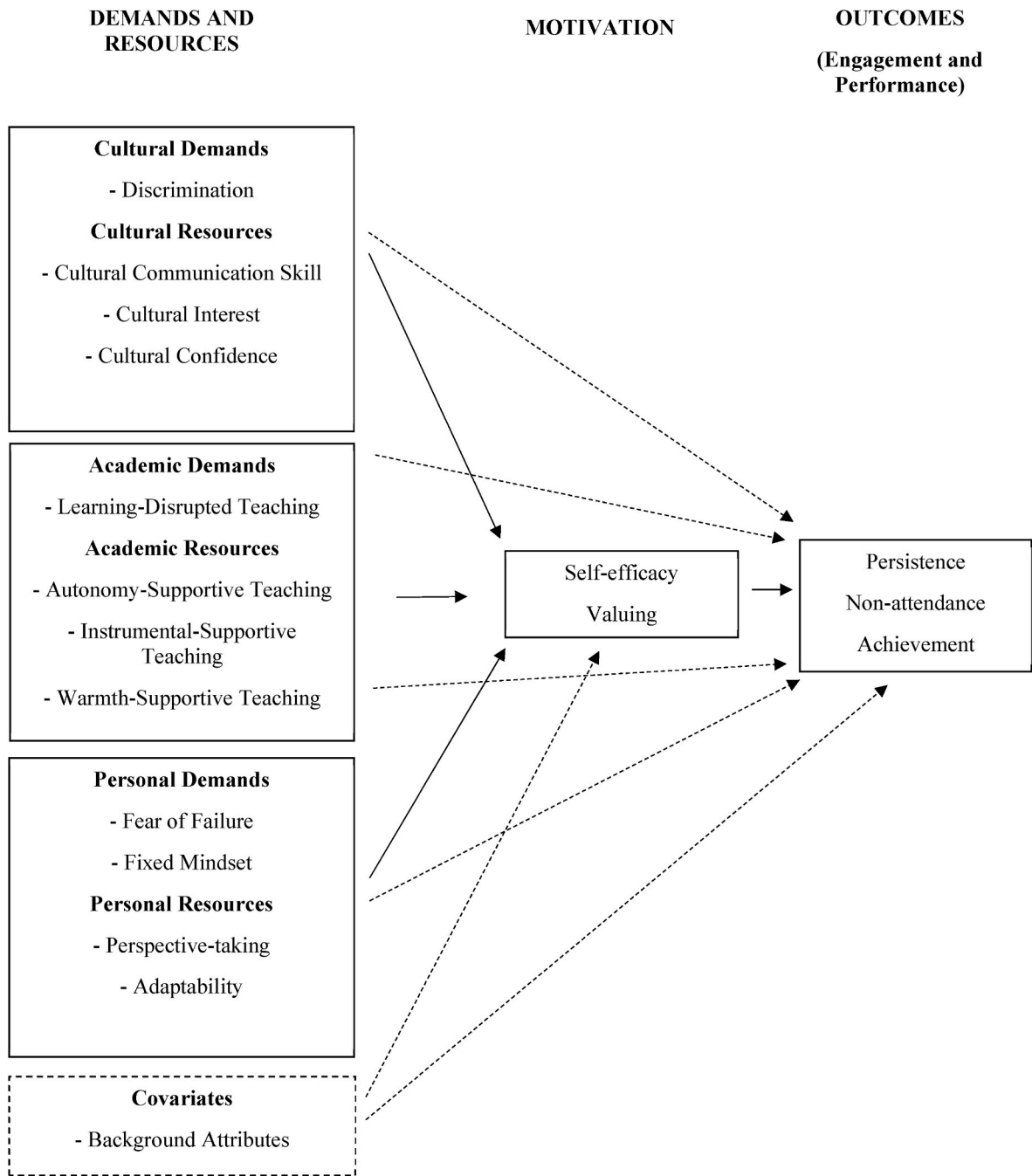


Fig. 1. Hypothesized Model.
Notes. Bold lines indicate central hypothesized substantive paths. Dashed lines indicate non-hypothesized paths and covariate paths. We use the term “cultural” (and on occasions, “ethno-cultural”) as an umbrella term to refer to individuals and communities who are from an ethnic, religious and/or linguistic group which constitutes a proportion of a population whose members share common characteristics of culture, language, and/or religion (Office of the High Commissioner for Human Rights, 2024). The study focuses on immigrant students as a particular case of cultural (or, ethno-cultural) diversity.

as those whose parents were both born in a country/economy other than that where the student sat the PISA test (OECD, 2020). It is also worth noting that immigrants can be further demarcated in terms of first and second generation status. First generation students are those who are foreign-born and whose parents are both foreign-born; second generation students are those who are born in the host nation but whose parents are both foreign-born (OECD, 2020). Due to their relative recency of arrival, first generation students may experience more barriers (e.g., learning a new language, negotiating an unfamiliar education system and curriculum, adjusting to a new culture; Martin et al., 2012, 2024; Martin & Collie, 2022). PISA (2018) data are especially useful for this study of immigrant students as this survey round comprised a unique set of items around students' cultural competence—a key element of the ACD-R framework—and also accounted for major background attributes such as first and second generation immigrant status.

Most research investigating immigrant students' academic outcomes has been somewhat diffuse, atheoretical, or overly narrow (for review see Cutmore et al., 2018; Martin & Collie, 2022; Martin et al., 2024; Martin, Ginns, et al., 2021). Without a guiding and integrative conceptual lens, practice and policy responses have potential to be ad hoc and ambit—hampering efforts to support immigrant students to successfully navigate academic life. It must be acknowledged there have been important theoretical contributions to better understand ethnically diverse students, but they have tended to focus on particular aspects of minority students' academic experience such as their motivational development (Graham, 1994; Graham & Hudley, 2005) or have been focused more on child/adolescent development than educational development (e.g., Garcia Coll et al., 1996). For this reason, the ACD-R framework was proposed as an encompassing educational lens to guide understanding of and research into immigrant students' educational development (Martin, Collie, & Nagy, 2021; Martin & Collie, 2022; Martin et al., 2023, 2024). As we describe below, this approach has potentially wide applicability because it accounts for the multifaceted contextual demands and resources that are involved in these students' academic development.

1. Demands and resources perspectives

Before we examine the ACD-R framework in detail, we first review the theorizing that led to its development.

1.1. Job demands-resources (JD-R) theory

A key pillar of the ACD-R framework is “job demands-resources” (JD-R) theory (Bakker & Demerouti, 2017; Schaufeli & Bakker, 2004). JD-R theory emerged from research seeking to improve workplace experiences and outcomes of employees. Being focused on improving experiences and outcomes, JD-R theory proposes there are contextual factors in employees' work roles that hinder or help their performance and outcomes (Schaufeli & Bakker, 2004). Job demands are features of work entailing psychological and/or physical exertion (e.g., navigating a heavy workload, meeting accumulating deadlines), and that are associated with psychological and/or physical costs (e.g., strain, burnout). Job resources are features of work helping employees attain work-related goals and growth (e.g., support from colleagues), and are associated with positive outcomes (e.g., motivation, positive workplace performance).

There are also personal demands and resources that are implicated in employees' work-related outcomes. Personal demands are personal attributes exacerbating the stress response and are linked with negative outcomes such as strain and burnout. Personal resources are personal attributes supporting employees' workplace functioning and are linked with positive outcomes. According to JD-R theory, demands evoke a health impairment process, while resources evoke an adaptive motivational process that mitigate against work-related demands.

Over and above the “main” effects of demands and resources, JD-R

also posits that “buffering” and “boosting” effects are possible (Bakker & Demerouti, 2017). That is, there can be factors that buffer adverse effects of job demands or boost positive effects of job resources. For instance, Granziera, Liem, et al. (2022) demonstrated that teachers' adaptability (a personal resource) reduced the adverse effect of role conflict (job demand) on emotional exhaustion (buffering effect). Similarly, Collie (2021) showed that helpful workplace feedback to teachers was more strongly related to their work commitment when they faced high levels of disruptive student behavior (boosting effect).

1.2. Academic demands-resources (AD-R) framework

In recent years, JD-R theory has expanded to account for the demands and resources in educational settings that impact students' academic development—referred to as the “academic demands-resources” (AD-R) framework (Martin, Collie, & Nagy, 2021; Martin & Collie, 2022; Martin et al., 2023; see also Lesener et al., 2020; Salmela-Aro et al., 2022 for related “study demands-resources” models). Just as JD-R is typically focused on workplace factors and processes, many of the same factors and processes are evident in the academic context (Martin, Ginns, et al., 2021, 2022). Academic demands comprise features of learning that require psychological and/or physical exertion (e.g., poor quality instruction, a heavy study load). Academic resources comprise aspects of learning that help students attain academic goals and growth (e.g., instructional support, positive teacher-student relationship). Academic demands are associated with lower levels of student motivation, while academic resources are associated with higher motivation (Martin, Collie, & Nagy, 2021; Martin & Collie, 2022; Martin et al., 2023).

There are also personal demands and resources implicated in students' academic development (e.g., Martin, Collie, & Nagy, 2021; Martin & Collie, 2022; Martin et al., 2023, 2024). Personal demands are personal attributes that are barriers to one's academic development (e.g., fear of failure, fixed mindset, difficulties with self-regulation). Personal resources are personal attributes that positively influence one's academic pathway (e.g., adaptability, academic buoyancy). Personal demands and resources are (respectively) linked with negative motivation (maladaptive intra-psychoeducational attributes such as anxiety and performance avoidance) and positive motivation (adaptive intra-psychoeducational attributes such as self-efficacy and valuing; Martin, Collie, & Nagy, 2021; Martin & Collie, 2022; Martin et al., 2023, 2024).

In addition, consistent with JD-R theory, the AD-R framework posits demands and resources in terms of buffering and boosting effects. That is, beyond the “main” effects of demands and resources, there are factors buffering the adverse effects of demands or boosting the positive effects of resources (Bakker & Demerouti, 2017; see also Collie, 2021; Collie et al., 2018; Granziera, Collie, & Martin, 2022). Taken together, the AD-R framework seeks to counter potential deficit framing of students by explicitly including their personal resources as a key to their academic development. It also seeks to shift the task of academic development from the sole or disproportionate responsibility of the student (that in some cases can tend towards “blaming the victim”) by locating contextual demands and resources as also key to students' academic outcomes (Martin & Collie, 2022).

2. The academic and cultural demands-resources (ACD-R) framework

Martin and Collie (2022) proposed an extension of the AD-R framework to include cultural demands and resources as a lens through which to investigate the experiences and outcomes of students from culturally and/or ethnically diverse backgrounds. They referred to this as the “academic and cultural demands-resources” (ACD-R) framework. In the ACD-R framework, the educational and personal demands and resources are the same as in the AD-R framework, but it is the inclusion of “cultural” demands and resources that has pertinence for

immigrant students.

According to Martin and Collie (2022; see also Martin et al., 2024), *cultural demands* are ethno-cultural personal and/or environmental challenges in the lives of students from culturally and/or ethnically diverse backgrounds that require psychological or physical exertion to navigate (e.g., racism at school) and are associated with psycho-educational costs (e.g., lower motivation). *Cultural resources* are ethno-cultural personal or environmental strengths or assets (e.g., cultural pride or confidence) helping students from culturally/ethnically diverse backgrounds to attain desired education-related goals and growth and are linked to positive psycho-educational outcomes such as higher motivation (Martin & Collie, 2022; Martin et al., 2024). Fig. 1 shows the basic model.

In addition, with regard to buffering and boosting effects that are posited in demands-resources models (see earlier discussion), there may be some cultural resources that reduce (buffer) the adverse impacts of demands—for instance, cultural pride or confidence (a cultural resource) may buffer the stressful effects of poor-quality teaching (an academic demand). Alternatively, when demands are high, cultural resources may play an impactful positive role. For example, cultural pride or confidence may boost motivation in the face of discrimination (a cultural demand). As Martin and Collie (2022; Martin et al., 2024) noted, these culturally-oriented buffering and boosting roles await empirical verification. Given the present study is focused on motivation (not stress), it is the boosting effects of cultural resources we are interested in.

As a further point, in line with the AD-R framework, the ACD-R framework seeks to counter potential deficit framing of immigrant students by emphasizing their personal resources as a key to their academic development. The ACD-R framework also seeks to shift the task of academic development from the sole or disproportionate responsibility of the immigrant student by emphasizing the role of contextual demands and resources in immigrant students' academic outcomes (Martin & Collie, 2022; Martin et al., 2024).

3. A closer look at demands and resources in the present study

Here we review the academic, personal, and cultural demands and resources that are central to the present study and (in line with the ACD-R framework) also summarize links between these demands and resources and students' motivation. As described below, motivation in the present study is operationalized by self-efficacy (students' belief in their capacity to engage in successful task-related action) and valuing (students' belief in the utility and importance of what they do and learn at school) (Bandura, 2001; Eccles & Wigfield, 2020). Because cultural demands and resources represent the most novel aspect of our study (and the ACD-R framework), we review this component first.

3.1. Cultural demands and resources

Martin and Collie (2022; Martin et al., 2024) identified an indicative set of cultural demands, including racism, discrimination, alienation, and disconnection—and cultural resources, including connection to one's culture, dimensions of cultural agency and confidence, and capacity to interact with others outside their culture or ethnic group. Taking their suggestions and the available PISA (2018) data into account, cultural demands in our study are represented by immigrant students' experience of discrimination at school—while cultural resources are represented by immigrant students' cultural communication skills, cultural interest, and cultural confidence. According to OECD (2020), these factors impact how immigrant students develop the knowledge, skills, and attitudes to successfully navigate a new culture (see also Council of Europe, 2018).

Discrimination can be demarcated into traditional, individual, and institutional forms (OECD, 2020). Traditional discrimination refers to a shared negative attitude about a group of people based on

generalizations and stereotypes. Individual discrimination refers to acts taken by an individual, such as a teacher. Institutional discrimination is systemic and entrenched at a group level, such as across a school. Survey items in the present study captured discrimination at school in each of these forms.

As a cultural resource, *cultural communication skill* is the capacity to understand cultural norms, interactive styles in intercultural contexts, and behaviour and communication that are appropriate to the cultural context (OECD, 2020). Cultural communication skill reflects students' ability to communicate clearly in diverse situations and make themselves understood, even if it is not their heritage language (Huber & Reynolds, 2014; Ribeiro, 2016). *Cultural interest* reflects an inclination to be exposed to different cultural influences and to engage with people whose culture is different from one's own (Council of Europe, 2018). Having an interest in learning about other cultures contributes to one's knowledge and understanding of culture (OECD, 2020). *Cultural confidence* reflects a view that immigrants should have the same educational opportunities as other people in the country, should be able to maintain their cultural customs and lifestyle, and should have the same rights as others in the country (OECD, 2020)—essentially, an immigrant student's sense they should have the dignity, confidence, and assuredness to access and attain educational opportunity.

The present study sought to ascertain the role of these cultural demands and resources in immigrant students' academic motivation. With regard to cultural demands, there is a well-established line of research showing that the effect of racism and discrimination at school can be to reduce immigrant students' motivation (see Benner et al., 2018 for a meta-analysis). With regard to factors under cultural resources, Oczlon et al. (2021) found that learning about multicultural topics in the classroom and positive intercultural relations experienced by immigrant students was positively associated with their academic self-concept. In related work, Schachner et al. (2019) found that cultural inclusion (e.g., positive contact among diverse students) significantly predicted immigrant students' school belonging. We are not aware of a great deal of other research investigating links between cultural resources and immigrant students' motivation, but can infer from the skills, orientations, and attributes inherent in these resources to suggest positive links to motivation. For example, the effects of clearly communicating in diverse situations and making oneself understood (cultural communication skill), developing one's knowledge and understanding of another culture (cultural interest), and an immigrant student's sense of confidence to access and attain educational opportunity (cultural confidence), can be feasibly suggested to underpin their perceived competence (self-efficacy) at school and the extent to which they intrinsically immerse and see yield in their academic application (valuing).

3.2. Academic demands and resources

A major academic demand imposed on students is the disrupted instruction that occurs when there are somewhat chaotic conditions in the classroom and where classroom behavior is off-task and distracting (Burns et al., 2021; Duesund & Ødegård, 2018). We refer to this as *learning-disrupted instruction*. When students are exposed to learning-disrupted instruction, they are also prone to become stressed and frustrated (Burns et al., 2021; Duesund & Ødegård, 2018), which are likely to undermine students' motivation in the form of perceived competence (e.g., self-efficacy; Burns et al., 2021). As relevant to the present study's motivational foci, learning-disrupted instruction is likely to be negatively associated with immigrant students' academic self-efficacy (because it hinders their sense of competence; Ryan & Deci, 2017) and task valuing (because it does not help students to internally endorse the utility of the tasks; Eccles & Wigfield, 2020; Ryan & Deci, 2017).

There are also various forms of instructional support that can assist students. Following Collie et al. (2021), we examine three forms of

instructional support. The first is *autonomy-supportive teaching*. This refers to the extent to which teachers support students' self-initiative and empowerment (Ryan & Deci, 2017; Skinner & Belmont, 1993). The second is *instrumental-supportive teaching*. This connotes the extent to which teachers provide feedback and structure for students to guide their improvement and learning (Skinner & Belmont, 1993). The third is *warmth-supportive teaching*. This refers to teachers' positive social-emotional interactions with students and their communication of warmth to support these positive interactions (Hughes & Cao, 2018). Indeed, these forms of academic resources represent key components of well-established models of effective instruction (e.g., Collie et al., 2021; Hamre et al., 2013) and are significantly associated with students' academic motivation, including their self-efficacy and valuing (e.g., Reeve, 2006).

3.3. Personal demands and resources

Under the ACD-R framework, personal demands refer to personal attributes that impede individuals' capacity to flourish academically and personal resources refer to personal attributes that facilitate individuals' academic development (Martin, Collie, & Nagy, 2021; Martin & Collie, 2022; Martin et al., 2023, 2024). In the context of the present study of immigrants using the PISA (2018) dataset, two personal demands relevant here are fear of failure and fixed mindset; two personal resources are perspective-taking and adaptability. Although the selection of these factors is in part guided by the parameters of what the PISA (2018) dataset has available, they do have particular pertinence to immigrant students. For example, many immigrants come to Australia and New Zealand so their children can access unique educational opportunities which may evoke evaluative concerns and fear of failure among immigrant students (Ferri et al., 2023). At the same time, it is not uncommon for there to be narrow and restrictive views of immigrants, which risks imposing fixed mindset beliefs on them (Sabarwal et al., 2022). In addition, perspective-taking and adaptability may be particularly important for immigrant students who have to navigate differences in worlds between their home culture and the school culture (Tomlinson & Jarvis, 2014).

Fear of failure has long-standing psycho-educational foundations (see Covington, 2000 for review), reflecting an individual's concerns about poor academic results, negative feedback, a lack of ability, and appearing incompetent. Failure fearers tend to be anxious and driven by fear and avoidance—often leading to poor academic motivation and outcomes (Covington, 2000). With regard to a *fixed mindset*, individuals who hold fixed beliefs about intelligence do not believe that intelligence and ability are malleable (e.g., Dweck, 2017). Those who have a fixed mindset tend to view failure as a threat to their intelligence and self-concept (Dweck, 2017) and tend to respond to academic challenges with lower motivation, defensive or helpless behavior, and disengagement (Blackwell et al., 2007; Dweck, 2017).

The study's personal resources comprise perspective-taking and adaptability. The capacity to see the world from others' perspective relies on the ability to operationalise knowledge and appraise situations involving multiple perspectives (OECD, 2020). This is referred to as *perspective-taking* and is essential for individuals to assess information to make sense of their situation and context (OECD, 2018, 2020).¹

¹ Although perspective taking is included in the PISA (2018) set of global competence measures, the items do not relate to culture and so this factor is considered a personal resource rather than a cultural resource.

Perspective-taking is implicated in students' critical thinking and analytical skills (OECD, 2020) and these may lay a foundation for a greater sense of academic confidence (self-efficacy) and capacity to use what they do in class to diverse aspects of school learning (valuing). *Adaptability* is the ability to adjust one's thinking, behaviour, and/or emotion to novel situations and contexts (Martin et al., 2013).² In making these adjustments, adaptable individuals effectively navigate novel, uncertain, and ambiguous circumstances and situations (Levin, 2015; Martin et al., 2023). Research has shown that adaptability is associated with higher levels of academic motivation (Martin et al., 2013), including factors such as self-efficacy (Martin et al., 2023).

4. Motivation and academic outcomes

Following the ACD-R framework, the academic, personal, and cultural demands and resources operate to impact students' motivation, that in turn impacts academic outcomes such as engagement and performance. For motivation, the present study draws on key factors in situated expectancy-value theory (Eccles & Wigfield, 2020)—perceived competence and valuing (operationalized by self-efficacy and valuing in this study). The theory describes how a student's perceived competence for success and the incentive value of a given task play a role in their achievement-related behavior (Eccles & Wigfield, 2020). Students high in *self-efficacy* are more likely to persevere if they do not meet with initial success and they tend to enact positive cognitive processes that help them meet task demands (Bandura, 2001; Martin, Balzer et al., 2022). Through these efforts they tend to be more engaged (e.g., persist, participate, attend) and achieve more highly (Eccles & Wigfield, 2020; Martin, Balzar et al., 2022). Indeed, in a study of immigrant students, Oczlon et al. (2021) found that perceived competence (self-concept) mediated the link between cultural-resource-like factors (e.g., positive intercultural relations) and academic achievement. With respect to *valuing*, students who see that what they learn is useful and/or important (i.e., high utility value and intrinsic value) tend to be more positively engaged, are less likely to academically withdraw, are more invested in achievement-related activity, and are more likely to achieve (Eccles & Wigfield, 2020; Martin et al., 2017). Taking self-efficacy and valuing together, we propose a link between these motivational factors and students' academic engagement in the forms of *persistence*, (*non*)*attendance*, and academic performance in the form of *achievement*. Each of these has been identified in previous research to be particularly emblematic of academically successful immigrant students (Cutmore et al., 2018; Martin, Burns, et al., 2022; Martin & Collie, 2022; Martin et al., 2012; OECD, 2006, 2020; Tomlinson & Jarvis, 2014).

5. Aims and hypotheses of the present study

The present investigation applied the ACD-R framework to better understand the academic experience of immigrant high school students (see Fig. 1). Drawing on PISA (2018) data from Australia and New Zealand, we first tested the measurement properties of the study's factors (primarily via confirmatory factor analysis) and then proceeded to the central structural equation modeling to investigate the role of academic, personal, and cultural demands in predicting motivation, and in turn, students' academic outcomes. Based on this modeling, we hypothesized that (beyond the effects of student and school background covariates): academic, personal, and cultural demands would predict lower motivation (self-efficacy and valuing; Hypothesis 1); academic,

² The majority of PISA (2018) adaptability items are domain-general, however, two items relate to interacting with people from other cultures. We dropped the outlying two items and modelled adaptability as a personal resource (not a cultural resource), in line with other research that models adaptability as a personal resource (Granziera, Collie, & Martin, 2022; Martin et al., 2023; Martin, Collie, & Nagy, 2021).

personal, and cultural resources would predict higher motivation (Hypothesis 2); motivation would predict more positive academic outcomes (higher persistence and achievement, lower non-attendance; Hypothesis 3). We also conducted two sets of auxiliary analyses that are detailed in Supplementary Materials. The first examined indirect effects from demands and resources to outcomes via motivation. The second investigated the role of resources in boosting motivation (self-efficacy, valuing) in the presence of any cultural demands in immigrant students' academic lives (viz. interaction effects).

6. Method

6.1. Participants, sampling, and procedure

The sample of immigrants for this study was drawn from the PISA (2018) dataset. For the purposes of testing our ACD-R framework among immigrants, countries retained for our study were required to meet three criteria: (a) OECD nations that administered the global competence survey scales (leaving 26 countries, excluding the United Kingdom as only Scotland administered these scales), (b) English-speaking nations (given difficulties in factor invariance and comparable measurement properties across English and non-English speaking nations; e.g., Asil & Brown, 2016—leaving Australia, New Zealand, and Canada), and (c) nations that administered the other key ACD-R scales (leaving Australia and New Zealand—as Canada did not include autonomy-, instrumental-, and warmth-supportive teaching items). The final sample comprised 4886 immigrant students, 3329 from Australia (53% first generation, 47% second generation) and 1557 from New Zealand (55% first generation, 45% second generation). The average age of students was 15.78 years ($SD = 0.29$). Just over half (51%) were male (and there was no significant difference in the proportion of first and second generation immigrants as a function of gender, $\chi^2 = 1.14$ (1), $p = 0.29$). On average, first generation immigrant students had arrived in the country between the ages of 8 and 9 years ($SD = 5.42$). Forty-two (42%) percent spoke their heritage language at home.

6.2. Measures

Measures in analyses assessed academic demands and resources, personal demands and resources, cultural demands and resources,

motivation, outcomes, and background attributes. Descriptive, reliability (Cronbach's alpha), and factor analytic properties for the measures are shown in Table 1. For the substantive factors, we report sample items below and in Supplementary Materials we provide the PISA codebook index labels (or the item codes where index labels are not available) for readers to locate and consult the full set of PISA items for each factor.

6.2.1. Academic demands and resources

Academic demands reflected the extent to which students experienced chaotic or disruptive learning and teaching conditions (5 items; e.g., “Students don't listen to what the teacher says”; 1 = Every Lesson to 4 = Never or Hardly Ever; reverse scored for analyses) referred to as *learning-disrupted teaching*. Academic resources reflected the extent to which students experienced teaching that provided autonomy support, instrumental support, and relatedness support (or warmth), referred to respectively as *autonomy-supportive teaching* (3 items; e.g., “The teacher listened to my view on how to do things”; 1 = Strongly Disagree to 4 = Strongly Agree), *instrumental-supportive teaching* (3 items; e.g., “The teacher tells me how I can improve my performance”; 1 = Never or Almost Never to 4 = Every Lesson or Almost Every Lesson), and *warmth-supportive teaching* (4 items; e.g., “It was clear to me that the teacher liked teaching us”; 1 = Strongly Disagree to 4 = Strongly Agree).

6.2.2. Personal demands and resources

Personal demands reflected students' *fear of failure* (3 items; e.g., “When I am failing, I worry about what others think of me”; 1 = Strongly Disagree to 4 = Strongly Agree) and *fixed mindset* (1 item; “Your intelligence is something about you that you can't change very much”; 1 = Strongly Disagree to 4 = Strongly Agree). Personal resources were represented by *perspective-taking* (5 items; e.g., “I try to look at everybody's side of a disagreement before I make a decision”; 1 = Very Much Like Me to 5 = Not At All Like Me; reverse coded for analyses) and *adaptability* (4 items; e.g., “I can change my behavior to meet the needs of new situations”; 1 = Very Much Like Me to 5 = Not At All Like Me; reverse coded for analyses).

6.2.3. Cultural demands and resources

Cultural demands were represented by *discrimination* at school (4 items; e.g., “[Teachers in your school] ... say negative things about

Table 1
Descriptive and psychometric statistics for substantive variables.

	Mean	Standard Deviation	Skew	Kurtosis	Reliability	Factor Loadings Range (Mean)
ACADEMIC DEMANDS & RESOURCES						
Learning-Disrupted Teaching	2.11	0.74	0.77	0.16	0.89	0.77-0.82 (0.80)
Autonomy-Supportive Teaching	2.89	0.74	−0.72	0.49	0.89	0.83-0.90 (0.86)
Instrumental-Supportive Teaching	2.69	0.83	−0.11	−0.70	0.91	0.82-0.93 (0.88)
Warmth-Supportive Teaching	3.01	0.68	−0.61	0.54	0.89	0.79-0.86 (0.82)
PERSONAL DEMANDS & RESOURCES						
Fear of Failure	2.80	0.79	−0.40	−0.28	0.82	0.72-0.91 (0.78)
Fixed Mindset	2.12	0.89	0.39	−0.63	–	1.00-1.00 (1.00)
Perspective-taking	3.72	0.79	−0.34	0.03	0.84	0.60-0.80 (0.72)
Adaptability	3.81	0.78	−0.50	0.37	0.86	0.77-0.82 (0.79)
CULTURAL DEMANDS & RESOURCES						
Discrimination	1.65	0.65	1.21	1.47	0.87	0.68-0.86 (0.79)
Cultural Communication Skill	3.09	0.55	−0.99	3.19	0.91	0.74-0.85 (0.79)
Cultural Interest	3.65	1.03	−0.46	−0.41	0.91	0.73-0.93 (0.85)
Cultural Confidence	3.37	0.65	−1.27	2.34	0.91	0.83-0.89 (0.85)
MOTIVATION						
Self-efficacy	3.04	0.48	−0.30	1.45	0.75	0.57-0.68 (0.62)
Valuing	3.40	0.75	−1.62	2.57	0.91	0.87-0.88 (0.87)
OUTCOMES						
Persistence	2.98	0.56	−0.49	1.08	0.74	0.50-0.73 (0.65)
Non-attendance	1.35	0.59	2.30	6.03	0.66	0.66-0.75 (0.71)
Achievement	509.62	95.48	−0.17	−0.46	–	1.00-1.00 (1.00)

Note: Some variables are single-item indicators and thus reliability was not estimated, and factor loadings were fixed to 1 with a residual of zero.

people of some cultural groups”; 1 = None or Almost None of Them to 4 = All or Almost All of Them). Cultural resources comprised *cultural communication skills* (7 items; e.g., “[Imagine you are talking in your native language to people whose native language is different from yours] ... I explain things very carefully”; 1 = Strongly Disagree to 4 = Strongly Agree), *cultural interest* (4 items; e.g., “I am interested in how people from various cultures see the world”; 1 = Very Much Like Me to 5 = Not At All Like Me; reverse coded for analyses), and *cultural confidence* (4 items; e.g., “Immigrant children should have the same opportunities for education that other children in the country have”; 1 = Strongly Disagree to 4 = Strongly Agree).

6.2.4. Motivation

Motivation comprised *self-efficacy* (5 items; e.g., “I feel that I can handle many things at a time”; 1 = Strongly Disagree to 4 = Strongly Agree) and *valuing* (3 items that capture utility and intrinsic aspects of valuing; e.g., “Trying hard at school will help me get a good job”; 1 = Yes to 2 = No; reverse coded for analyses).

6.2.5. Outcomes

Outcomes comprised two measures of engagement—*persistence* (4 items; e.g., “Once I start a task, I persist until it is finished”; 1 = Strongly Disagree to 4 = Strongly Agree) and *non-attendance* (2 items; e.g., “In the last two full weeks of school I skipped a whole school day”; 1 = Never to 4 = Five or More Times)—and also *achievement* (mathematics, science, reading). In PISA (2018), mathematics was assessed via: recognizing and identifying appropriate mathematical approaches; employing mathematical concepts and facts; and, interpreting, applying, and evaluating mathematical outcomes. Science was assessed by way of: understanding different personal, local, national, and global contents; content, procedural, and epistemic knowledge relating to science facts, concepts, and theories; and, competencies such as explaining, evaluating, and interpreting science tasks and data. Reading was assessed by way of: locating information; comprehension and integrating knowledge; and evaluating and reflecting. Students’ mathematics, science, and reading scores are each transformed to ten (Bayesian) plausible values (OECD, 2020). Plausible values seek to represent the range of abilities that a student might reasonably be considered to have. The OECD (2019) report provides details of the PISA (2018) mathematics, science, and reading tests, scoring, and plausible values. Data Analysis below describes how we managed the plausible values via imputation techniques.

6.2.6. Background attributes

We controlled for student and school covariates potentially implicated in immigrant students’ academic development. The student covariates were: *age*, *gender*, *socio-economic status*, *first generation status*, and *non-English-speaking at home*. In addition, although we found no differences between Australia and New Zealand in fundamental measurement properties of our substantive factors—as demonstrated by invariance in the number of factors and factor loadings in a multi-group multi-factor CFA of academic demands and resources, personal demands and resources, cultural demands and resources, motivation, outcomes (i. e., minimum criteria for invariance, Marsh et al., 2006; Δ CFI = -0.010 , Δ RMSEA < -0.015 ; Chen, 2007; Cheung & Rensvold, 2002)—for completeness, we also included *country* as a covariate. From the school PISA survey completed by a designated school leader we merged into our dataset the following school covariates: *school staff/student ratio*, *school location*, *school percentage of socio-economically disadvantaged students*, *school type*, and *percentage of immigrant students in the school*. Full details on each of these covariates and how they were measured are in Supplementary Materials.

6.3. Data analysis

Confirmatory factor analysis (CFA) and structural equation modeling (SEM) were the central analyses, conducted with Mplus version 8.80

(Muthén & Muthén, 1998–2022). These analyses employed the MLR (maximum likelihood robust to non-normality) estimator that generates a chi-square test statistic and parameter estimates with standard errors that are robust to non-normality (Muthén & Muthén, 1998–2022). A Comparative Fit Index (CFI) greater than 0.95 and a Root Mean Square Error of Approximation (RMSEA) less than 0.05 indicated very good fit (Kline, 2016). A weighting variable (“W_FSTUWT”) was included in modeling to adjust (by country) as a function of population and sample sizes. As described in Measures, because ten plausible values were generated for each student for each of mathematics, science and reading achievement tests (OECD, 2020), we created datasets to be imputed so that each of the ten plausible values was included in one of the ten to-be-imputed datasets. We then imputed items for all constructs (i.e., “covariate”, “predictor”, and “mediator” constructs) in each of these datasets separately and carried out analyses for each of the imputed datasets in Mplus (using the “Type is Imputation” command) and present the pooled results. Because the imputations provided estimates for all items for each of the ten imputed datasets and because PISA achievement plausible values have no missing data, it meant that the imputed datasets that we analyzed did not have missing data. Based on the mean missing data rate of 4.96% across all variables and our 10 imputations, we calculated Rubin’s (1987) relative efficiency (RE) index as a robust 99.50%. Intra-class correlations for the substantive factors as a function of school were low ($M = 0.04$) but for achievement it was high (0.27) as has previously been established (Hedges & Hedberg, 2007). Therefore, we conservatively set “school” as the clustering variable (using the Mplus “Type = Complex” option) to adjust standard errors to account for the nesting of students within schools (classroom-level data are not available in the PISA [2018] dataset and so we could not model at this level).

For the CFA, all demand, resource, motivation, outcome, and background variables were included—thus, a 28-factor CFA. Multi-item measures were estimated as latent factors and single item indicators (e.g., gender, age) had loadings set at 1 and residuals at 0. This CFA was also the basis of the inter-factor correlations and the measurement component underlying the hypothesized SEM (Fig. 1). In this SEM, we tested the model in two steps. Step 1 was an indirect effects model: demands and resources \rightarrow motivation \rightarrow outcomes. In this model, background attribute covariates also predicted motivation and outcomes; demands, resources, and covariates were correlated; and motivation factors were correlated. In Step 2, we inspected modification indices and included any significant direct paths between demands and resources and students’ academic outcomes. Because these direct paths were not hypothesized, we adopted a conservative approach to deciding whether to include them; namely, any paths that exceeded a medium effect size as per Keith (2015; $\beta > 0.10$).

We also conducted two sets of auxiliary analyses for each of the imputed datasets in Mplus (using the “Type is Imputation” command) and report the pooled results. The first examined indirect effects—namely, the extent to which motivation (self-efficacy, valuing) linked demands and resources to students’ academic engagement (persistence, non-attendance) and performance (achievement). The second investigated the role of resources in boosting motivation (self-efficacy, valuing) in the presence of cultural demands—thus, testing for interaction effects. We present the detailed results in Supplementary Materials and summarize the main findings in Results below.

7. Results

7.1. Preliminary analyses: Descriptive, correlational, and psychometric properties

Descriptive statistics for the central substantive factors (demands and resources, motivation, outcomes) are shown in Table 1. These demonstrate acceptable reliability. With regard to distributional assumptions, data in Table 1 indicate approximately normal distributions

by way of skew (−2 to 2) and kurtosis (−7 to 7) values (Hair et al., 2010; though, as noted in Data Analysis, CFA and SEM employed MLR to generate estimates robust to non-normality; Muthén & Muthén, 1998–2022). We conducted a CFA of all 28 factors (substantive factors and background attributes) to test dimensionality and generate the full correlation matrix that underlay the structural model. This yielded a very good fit to the data, $\chi^2 = 8001.76$, $df = 2190$, $p < 0.001$, CFI = 0.95, RMSEA = 0.02. For completeness, we conducted a CFA of just substantive factors, which also yielded a very good fit to the data, $\chi^2 = 6757.78$, $df = 1695$, $p < 0.001$, CFI = 0.95, RMSEA = 0.03, and near-identical factor loadings to those of the full CFA reported in Table 1. Correlations from the CFA are shown in Table S1 of Supplementary Materials. There we also report correlations that pertain to the hypothesized substantive links. From Table S1 it can be seen that these bivariate associations provided preliminary support for the hypothesized links among the demands and resources, motivation, and outcomes—and so analyses proceeded to multivariate structural equation modeling.

7.2. Central modeling: structural equation modeling

Consistent with the ACD-R framework presented in Fig. 1 (and described in the Data Analysis section), we tested a model in which (controlling for student and school background covariates) academic, personal, and cultural demands and resources predicted motivation (self-efficacy, valuing) that in turn predicted outcomes (persistence, non-attendance, achievement). We also checked (via modification indices) for any direct paths between demands/resources and outcomes that warranted inclusion—leading to five additional paths. The final model yielded a very good fit to the data, $\chi^2 = 8369.98$, $df = 2221$, $p <$

0.001, CFI = 0.95, RMSEA = 0.02. All findings are shown in Table 2 and all statistically significant substantive paths are shown in Fig. 2.

There was predominant support for Hypothesis 1 (that demands predict lower motivation) and Hypothesis 2 (that resources predict higher motivation). For academic demands and resources, instrumental and warmth-supportive teaching predicted higher self-efficacy ($\beta = 0.06$, $SE = 0.02$, $p < 0.01$; $\beta = 0.15$, $SE = 0.03$, $p < 0.001$). For personal demands and resources, fear of failure predicted lower self-efficacy ($\beta = -0.12$, $SE = 0.03$, $p < 0.001$)—but also predicted higher persistence ($\beta = 0.20$, $SE = 0.02$, $p < 0.001$) and achievement ($\beta = 0.14$, $SE = 0.02$, $p < 0.001$); a fixed mindset predicted lower self-efficacy ($\beta = -0.05$, $SE = 0.02$, $p < 0.05$), valuing ($\beta = -0.05$, $SE = 0.02$, $p < 0.05$), and achievement ($\beta = -0.20$, $SE = 0.02$, $p < 0.001$); and adaptability predicted higher self-efficacy ($\beta = 0.38$, $SE = 0.03$, $p < 0.001$) and valuing ($\beta = 0.05$, $SE = 0.02$, $p < 0.05$). For cultural demands and resources, discrimination predicted lower valuing ($\beta = -0.07$, $SE = 0.02$, $p < 0.01$) and achievement ($\beta = -0.25$, $SE = 0.02$, $p < 0.001$) and higher non-attendance ($\beta = 0.20$, $SE = 0.03$, $p < 0.001$)—but also higher self-efficacy ($\beta = 0.09$, $SE = 0.03$, $p < 0.001$); cultural communication skills predicted higher self-efficacy ($\beta = 0.19$, $SE = 0.03$, $p < 0.001$) and valuing ($\beta = 0.06$, $SE = 0.03$, $p < 0.05$); cultural interest predicted higher self-efficacy ($\beta = 0.06$, $SE = 0.02$, $p < 0.05$); and cultural confidence predicted higher self-efficacy ($\beta = 0.12$, $SE = 0.03$, $p < 0.001$) and valuing ($\beta = 0.05$, $SE = 0.02$, $p < 0.05$).

There was predominant support for Hypothesis 3 (that motivation predicts positive academic outcomes). Both self-efficacy and valuing predicted higher persistence ($\beta = 0.66$, $SE = 0.02$, $p < 0.001$; $\beta = 0.08$, $SE = 0.02$, $p < 0.001$), lower non-attendance ($\beta = -0.18$, $SE = 0.03$, $p < 0.001$; $\beta = -0.12$, $SE = 0.03$, $p < 0.001$), and higher achievement ($\beta = 0.07$, $SE = 0.02$, $p < 0.001$; $\beta = 0.05$, $SE = 0.02$, $p < 0.01$). As Table 2

Table 2
Standardized path Coefficients.

	MOTIVATION		OUTCOMES		
	Self-efficacy	Valuing	Persistence	Non-attendance	Achievement
ACADEMIC DEMANDS & RESOURCES					
Learning-Disrupted Teaching	−0.03	−0.02	–	–	–
Autonomy-Supportive Teaching	0.01	0.04	–	–	–
Instrumental-Supportive Teaching	0.06**	0.03	–	–	–
Warmth-Supportive Teaching	0.15***	0.05	–	–	–
PERSONAL DEMANDS & RESOURCES					
Fear of Failure	−0.12***	0.02	0.20***	–	0.14***
Fixed Mindset	−0.05*	−0.05*	–	–	−0.20***
Perspective-taking	0.01	0.04	–	–	–
Adaptability	0.38***	0.05*	–	–	–
CULTURAL DEMANDS & RESOURCES					
Discrimination	0.09***	−0.07**	–	0.20***	−0.25***
Cultural Communication Skills	0.19***	0.06*	–	–	–
Cultural Interest	0.06*	0.01	–	–	–
Cultural Confidence	0.12***	0.05*	–	–	–
MOTIVATION					
Self-efficacy	–	–	0.66***	−0.18***	0.07***
Valuing	–	–	0.08***	−0.12***	0.05***
BACKGROUND ATTRIBUTES					
Country (Australia/New Zealand)	0.01	0.01	0.01	−0.02	0.01
Age	−0.05**	−0.02	0.03	0.02	0.03
Gender (Male)	0.04*	−0.05**	−0.06***	−0.01	0.06**
Socioeconomic Status (SES)	0.05*	0.04*	0.02	−0.01	0.17***
Generation (First)	−0.02	−0.02	0.03*	0.02	−0.06**
Home Non-English Speaking	0.05**	−0.02	0.01	−0.01	−0.04*
School Staff/Student Ratio	−0.01	0.02	0.01	0.03	0.02
School Location (Rural to Urban)	0.01	0.03	0.01	−0.01	0.02
School SES Disadvantage	0.07**	0.04	0.03	0.10***	−0.24***
School Type (Private)	0.01	0.03	−0.01	0.03	−0.02
School Immigrant Percentage	0.02	−0.03	0.01	0.01	0.05
R ²	0.41***	0.07***	0.48***	0.12***	0.34***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Paths between demand/resource predictors and outcomes are non-hypothesized and added after suggested modification indices.

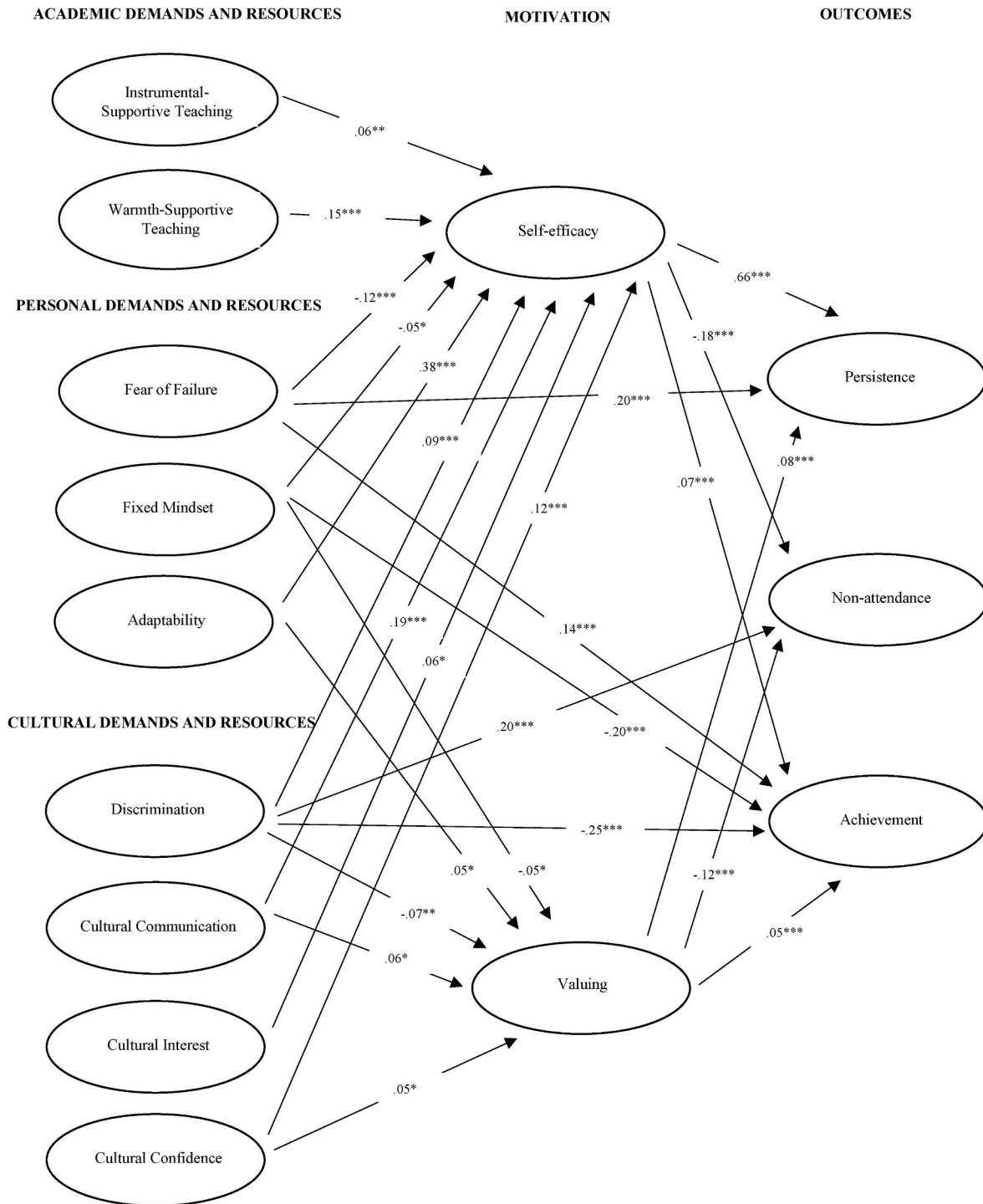


Fig. 2. Statistically significant paths in final model.

also shows, the demands and resources predictors in the model explained a significant proportion of variance in each of self-efficacy ($R^2 = 0.41$, $SE = 0.02$, $p < 0.001$), valuing ($R^2 = 0.07$, $SE = 0.01$, $p < 0.001$), persistence ($R^2 = 0.48$, $SE = 0.03$, $p < 0.001$), non-attendance ($R^2 = 0.12$, $SE = 0.02$, $p < 0.001$), and achievement ($R^2 = 0.34$, $SE = 0.02$, $p < 0.001$).

7.3. Auxiliary modeling: Indirect and interaction effects

We summarize findings for indirect and interaction effects here and present detailed results in Supplementary Materials. All statistically

significant indirect effects are shown in Table S2 of Supplementary Materials. These results show that both self-efficacy and valuing (motivation) significantly linked demands and resources to students' academic outcomes. Of the two, self-efficacy played the more prominent role, with most indirect effects associated with it. For the interactions, all significant effects are shown in Table S3. After statistically adjusting for the number of interactions to avoid Type II error, there remained only one significant interaction: adaptability x discrimination → valuing ($\beta = 0.10$, $SE = 0.03$, $p < 0.001$). Follow-up plotting of this interaction (see Fig. 3) indicated that for students who experienced high discrimination, their valuing increased as their adaptability increased,

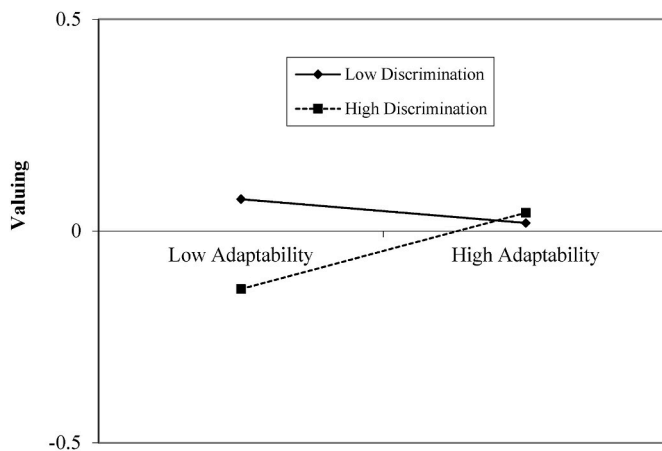


Fig. 3. Discrimination \times Adaptability Interaction for Valuing (zero-centered).

suggesting that adaptability becomes particularly important in the face of discrimination.

8. Discussion

The present investigation applied the academic and cultural demands-resources (ACD-R) framework to better understand the academic experience of immigrant high school students. There was support for Hypothesis 1 (that demands predict lower motivation) and Hypothesis 2 (that resources predict higher motivation). Findings also showed that self-efficacy and valuing significantly predicted persistence and achievement (positively) and also non-attendance (negatively), supporting Hypothesis 3 (that motivation predicts positive academic outcomes). This pattern of findings therefore reflects what is posited in the ACD-R framework.

8.1. Findings of note

As our theoretical frame emphasized the novel inclusion of cultural demands and resources, we structure the discussion by dealing with these first.

8.1.1. Cultural demands and resources

It is noteworthy that the cultural demands and resources played a more prominent predictive role for immigrant students in the model than academic and personal demands and resources. Cultural demands and resources are therefore considered an important inclusion in future research among immigrant students. Cultural demands in the present study were represented by discrimination experienced by immigrant students at school, particularly from their teachers. Not only did discrimination predict lower valuing (as hypothesized), but it also directly predicted non-attendance and lower achievement as well. This is consistent with prior research (e.g., Benner et al., 2018) and typically has these impacts because discrimination elevates students' stress that is at cross-purposes with their motivation (Forde et al., 2019), leaves immigrant students feeling excluded (OECD, 2020), and when conducted by teachers can function as a form of role modeling for other students to be discriminatory (OECD, 2020). Unexpectedly, discrimination also predicted higher self-efficacy; however, the bivariate correlation was (non-significant) negative and so interpreting this effect requires further research. Perhaps it is a "true" effect after the multivariate controls for shared variance are accounted for (e.g., perhaps this self-assertion of competence is a "survival" response to discrimination that immigrant students have had to develop to cope in school), or perhaps it is a statistical artifact (e.g., suppression effect). Additional research is needed to delve further into this finding.

Beyond the role of discrimination, there were cultural resources that

predicted higher motivation. Specifically, cultural communication skills and cultural confidence predicted higher self-efficacy and valuing, while cultural interest predicted higher self-efficacy (see also Oczlon et al., 2021; Schachner et al., 2019). Thus, cultural communication and cultural confidence were especially salient among immigrant students. Cultural communication skills enable immigrant students to effectively express themselves to people from other cultures (Collier, 2015) and understand people from other cultures (Huber & Reynolds, 2014)—even if it is not their native heritage language (OECD, 2020). This is likely to enhance pedagogical and interpersonal connections with teachers and peers and these connections are known to underpin motivation (Ryan & Deci, 2017). Cultural confidence—reflecting a belief that immigrants should have the same opportunities and rights as others in the country—also predicted motivation. It may be that cultural confidence connotes a sense of agency that instills perceptions of control and efficacy that are important to students' educational development (Reeve, 2006).

8.1.2. Academic demands and resources

The two academic factors that did play a particularly salient role were both resources, in the forms of instrumental- and warmth-supportive teaching, and significantly predicted higher self-efficacy. Instrumental support involves the practical help from teachers that assists students to develop academic skills and solve academic problems and this is likely to boost their academic confidence (Granziera, Liem, et al., 2022). In terms of warmth support, the provision of such support enhances students' belief in their own abilities and enhances their confidence to navigate academic tasks (Granziera, Liem, et al., 2022; Ruzek et al., 2016).

We also draw the reader's attention to some of the relatively modest effects of academic demands and resources in our study, especially with regard to learning-disrupted and autonomy-supportive teaching (further below we discuss the limited effects associated with valuing). In fact, as noted, in this study of immigrant students it is interesting to observe that cultural demands and resources were more predictive of motivation and academic outcomes than academic demands and resources. To explain this, we point to the substantive alignment of cultural demands and resources with immigrant students' lived experience at school (with regard to discrimination, etc.; Benner et al., 2018). Accordingly, when cultural demands and resources are concomitantly included in modeling of immigrant student data, they may attenuate some of the influence of academic factors (e.g., autonomy-supportive teaching) that are typically linked to students' motivation (Ryan & Deci, 2017). As we suggested above, this underscores the importance of including ethno-cultural predictors alongside academic predictors when focusing the investigation on immigrant students. In the case of our study, these ethno-cultural factors were represented in the ACD-R framework by way of cultural demands and resources.

8.1.3. Personal demands and resources

Personal demands and resources were also salient in the model. In fact, of all the predictors in the model, it was a personal resource—adaptability—that yielded the largest effect size, significantly predicting higher self-efficacy ($\beta = 0.38$). This is not surprising, as adaptability refers to a capacity to effectively navigate novelty, uncertainty, and change (Martin et al., 2013)—experiential phenomena that immigrant students must frequently tackle (OECD, 2020). In fact, adaptability was also the only resource that featured in the interactions: adaptability became particularly important for valuing in the face of discrimination (see Fig. 3). Adaptability as a main effect and as a moderator is thus a vital attribute for immigrant students' academic development.

In line with hypotheses, motivation (self-efficacy and valuing) significantly predicted all outcomes: higher persistence, lower non-attendance, and higher achievement. Of the two, self-efficacy played a more predictive role and also was the main factor through which the numerous indirect effects (demands and resources \rightarrow motivation \rightarrow

outcomes) operated (see Supplementary Materials). Consistent with various theories (e.g., social-cognitive theory, situated expectancy-valuing theory; Bandura, 2001; Eccles & Wigfield, 2020), self-efficacious students are inclined to explore alternative courses of action when faced with challenge, invest greater effort in task demands, and resist temptations to give up (Bandura, 2001; Eccles & Wigfield, 2020; Martin, Balzer et al., 2022)—all factors explaining this study's links with similar such outcomes. Why predictive paths were relatively smaller for valuing is for future research to ascertain, but we speculate that immigrant students and their families may not have been in the host country long enough to realize some of the utility dimensions of school inherent in valuing. For example, one aspect of valuing is seeing the connection between school and post-school opportunities (Martin, Balzer et al., 2022) and immigrants may not yet have had the chance to see or experience this. By implication, the yield of valuing for immigrant students may be somewhat lower than it typically is for non-immigrant students (Wigfield et al., 2017).

8.2. Implications for theory and practice

JD-R theory was recently adapted to the academic domain to better understand students' educational experiences and development—leading to the AD-R framework (Martin & Collie, 2022; Martin et al., 2024; and related perspectives; e.g., the Study Demands-Resources model; Lesener et al., 2020; Salmela-Aro et al., 2022). Consistent with initial research empirically confirming the AD-R framework (Martin, Collie, & Nagy, 2021; Martin et al., 2023), Martin and Collie (2022; Martin et al., 2024) proposed that including a cultural dimension (cultural demands and resources) may have particular pertinence to ethnically and/or culturally diverse students. Following their argument, the present study empirically modelled immigrant students' cultural demands and resources alongside academic and personal demands and resources. Based on the present findings, we conclude there is support for ACD-R conceptualizing, particularly for the role of cultural demands and resources in immigrant students' academic experience.

We also suggest there are practice implications following this conceptual expansion to cultural demands and resources. We address discrimination—a cultural demand—first. As operationalized in the present study, this referred to discrimination by teachers. According to OECD (2020), it is important for teachers to act as positive role models in respectfully interacting with immigrant students, especially as other students will emulate this positive behavior. It is also important for teachers to proactively step in to support immigrant students if they are struggling academically or socially at school (OECD, 2020). Schools with clear rules around intercultural relations and discriminatory attitudes and behaviors are also likely to be more effective at countering discrimination (OECD, 2020). How and when teachers learn these things begins in pre-service teacher training and continues as professional development and in-servicing (e.g., Scrimgeour & Ovsienko, 2015).

Turning to cultural resources, it has been established that communication skills can be taught (Johnson et al., 2021). For example, teaching and role-playing oral communication skills, non-verbal and visual communication, active listening, and contextual communication can be effective means to assist students to better express themselves and be better understood. With regard to cultural interest, two approaches to inspire two-way interest among immigrant and non-immigrant students is through activating prior interest (e.g., leverage previous interest to evoke present interest) and enhancing utility value (e.g., identifying the usefulness or importance of learning more about someone or something) (Harackiewicz et al., 2016). For cultural confidence, it has been suggested that affirming students' cultural identity, meaningful involvement of immigrant students' cultural community at school, and appropriate representation of staff from culturally and/or ethnically diverse backgrounds are important bases for cultural confidence (Lowe, 2017; Martin, 2006).

Finally, we draw attention to adaptability (indeed, the strongest

predictor among all the demands and resources). From an applied perspective, Martin et al. (2013; see also Burns & Martin, 2014; Martin & Burns, 2014; Martin, Collie, & Nagy, 2021) suggested teaching students a tripartite approach. For example, students can: (a) adjust cognition by thinking about a new situation in a different way (e.g., considering the opportunities a new situation might offer); (b) adjust behavior by seeking out new or more resources or information (e.g., asking a teacher to help with a new situation); and (c) adjust emotions by minimizing negative feelings (e.g., frustration) in a new situation (e.g., choosing not to focus on disappointment if something arises that is not to the student's preference) (see also Davis et al., 2024; Putwain et al., 2019).

8.3. Limitations and conclusion

There are some limitations important to recognize when interpreting results and which provide some direction for future research. First, although PISA (2018) data were very useful for this study of immigrant students (who may otherwise be difficult to recruit in large numbers), the PISA survey was not purpose built for our study. We therefore had to apply some flexibility in item and factor selection to explore the ACD-R framework. For example, we applied some judgement in selecting factors from the very large PISA dataset to best test the ACD-R framework; in addition, we removed some items that did not conceptually reflect the target construct (e.g., two items were removed from the adaptability scale because they did not refer to domain-general adaptability that is the intended construct in the literature; Martin et al., 2013). That said, we remind the reader of the very good CFA fit, strong loadings, and high reliabilities for our measures. We also point out there are many cultural demands and resources identified in Martin and Collie's (2022; Martin et al., 2024) hypothesized ACD-R framework and future research could develop fit-for-purpose measures to more precisely assess them. In addition, we initially considered whether immigrant generation status should be considered a substantive factor in our study and positioned as a demand, but for two reasons we kept open the possibility that what appears to be a demand may not be a demand. First, demand-resource perspectives identify the role of appraisal in determining whether something may be a demand—with positive appraisals of a “demand” rendering it something of a resource (Ma et al., 2021). For example, if an immigrant student has pride in being born overseas, pride in their culture and attends a culturally responsive school, their first-generation status may be experienced as a resource and drive a motivational process (in line with demand-resource perspectives; Martin et al., 2024). Second, it may not be immigrant generation status per se that is a demand but rather the academic and cultural demands that are present in the lives of, for example, a first-generation immigrant. In such cases, modelling immigrant generation status as a cultural demand is not accurate—it is the accompanying demands that are driving the motivation impairment process (Martin et al., 2024). Thus, although immigrant generation status was a predictor in the model alongside the demands and resources (as shown in Table 2), we did not frame or interpret immigrant generation status in terms of demand and resource implications.

Second, many countries were excluded from our study because their students did not complete key measures that were important for testing the ACD-R framework (see Method for inclusion/exclusion details). Purposeful sampling and survey work in future research can look to expand the number of countries involved. Third, the dataset comprised cross-sectional data. Longitudinal work is needed in order to identify the role of demands and resources in, for example, predicting gains/declines in students' motivation and outcomes. Fourth, unregistered or undocumented immigrants are not usually included in PISA data and so the present study is based on students who could be identified and represented. On a related note, the PISA data have relatively little information about country of origin, and so we could only assess factors in the resident nation. Future research might seek to garner more background detail on immigrant students. Notwithstanding these limitations and

with regard to the future research opportunities suggested by the present findings, this study has demonstrated that the ACD-R process is a viable means to understand immigrant students' academic experience and to offer some fruitful direction for supporting their academic development.

CRedit authorship contribution statement

Andrew J. Martin: Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Conceptualization. **Rebecca J. Collie:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Lars-Erik Malmberg:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.learninstruc.2024.101903>.

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