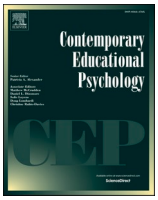
Contemporary Educational Psychology 73 (2023) 102171

Contents lists available at ScienceDirect

Contemporary Educational Psychology

journal homepage: www.elsevier.com/locate/cedpsych



(Not) swimming with the big fish: Primary school students' competence satisfaction and frustration in high-ability pull-out classes

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ARTICLE INFO

Keywords:
Pull-out class
Need for Competence
High-ability students
Big-fish-little-pond effect
Assimilation effect
Self-Determination Theory

ABSTRACT

According to self-determination theory, one of the basic psychological needs is the need to feel competent. Within this theoretical framework, little attention has been paid to how comparisons with peers may affect students' need for competence. The aim of this study was therefore to examine how reference group effects are associated with primary school students' need for competence. Thereto, this study focused on high-ability pull-out classes as these provide the opportunity to compare competence perceptions both *between* students participating and not participating in high-ability pull-out classes and *within* high-ability students across their two educational contexts. Competence satisfaction and frustration were assessed twice in 3rd-6th graders (M_{age} = 9.83, SD = 1.20) with one year in between. Results of multilevel analyses showed that high-ability pull-out students (N = 221) reported higher levels of competence satisfaction and lower levels of competence frustration than their classmates not participating in pull-out classes (N = 1,754), while controlling for individual and class-average achievement. Furthermore, when fewer classmates were selected to participate in the pull-out program (i.e., higher selectivity) both pull-out students and non-participating students reported higher competence satisfaction and lower competence frustration. Pull-out students reported higher levels of competence satisfaction and lower levels of competence frustration in their pull-out class than in their regular class. In all, the findings suggest that assimilation effects outweighed big-fish-little-pond effects, possibly because of the high salience of membership of the high-ability pull-out class. When implementing a high-ability pull-out class in primary school, the consequences for students participating as well as for those not participating should be taken into account.

1. Introduction

Self-determination theory posits that every human being has three basic psychological needs: the needs for autonomy, competence, and relatedness (Ryan & Deci, 2020). Satisfaction of these needs contributes to students' motivation, performance, and development in achievement settings (Deci et al., 1991; Ryan & Deci, 2020). The present study focuses specifically on students' need for competence—that is, the desire to feel effective and able to meet the challenges of their schoolwork (Vansteenkiste et al., 2020). Abundant research from the perspective of self-determination theory has examined how teachers, through their interactions with their students, can support their students' need for competence (Bureau et al., 2022; Stroet et al., 2013). Yet, within self-determination theory, little is known about how comparisons with peers may affect students' need for competence. This is unfortunate as research on a similar concept, academic self-concept (i.e., students' perceptions of their competence in academic situations) suggests that students' competence perceptions also rely strongly on comparisons' with classmates (Marsh et al., 1995; Preckel et al., 2010; Zeidner & Schleyer, 1998, 1999). The main aim of the present study was therefore to examine whether satisfaction (or frustration) of primary school students' need for competence is also dependent on such reference group effects.

To examine this phenonemon, we focus on primary school students

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https://doi.org/10.1016/j.cedpsych.2023.102171

Available online 15 March 2023

who attend *high-ability pull-out classes*. A high-ability pull-out class is a class which high-ability students attend for only a portion of the week (usually 2–3 hours a week) together with other high-ability students. These programs usually provide general enrichment across a range of domains. The rest of the week, these students attend a regular mixed-ability class where the regular curriculum is covered.

High-ability pull-out classes have become increasingly popular over the past few decades in Dutch primary education (OECD, 2016; Suijkerbuijk et al., 2021; Doolaard and Oudbier, 2010). Whereas in 2010, only 40 percent of primary schools in the Netherlands offered a high-ability pull-out class (Doolaard & Oudbier, 2010), in 2021, this percentage was increased to 77 percent (Suijkerbuijk et al., 2021). High-ability programs have been found to be effective for high-ability students' achievement (Kim, 2016, Kulik & Kulik, 1982, 1992; Rogers, 2007; Shields, 2002), but a commonly voiced concern is that participation in a high-ability program may lower students' perceptions of their competence, because students in these programs will compare their ability to other highly able peers (Vogl & Preckel, 2014). This is referred to as the 'big-fish-little-pond-effect' (Marsh, 1987) and this effect has indeed been found among students participating in *full-time* high-ability programs (e.g., Marsh et al., 1995; Preckel et al, 2010). Full-time high-ability programs are attended five days a week and cover the regular curriculum and provide enrichment (Doolaard & Oudbier, 2010). The effects of participation in a high-ability pull-out class may differ however from the effects of full-time high-ability programs, because pull-out classes are only attended part-time, and participating students therefore have two different reference groups to which they can compare their abilities: their classmates in their regular mixed-ability class and their classmates in the high-ability pull-out class. Given their increased popularity, it is important to gain more insights into the potential effects on students' perceptions of their competence.

Additionally, pull-out programs differ from full-time high-ability programs as the other students in the regular class are regularly exposed to classmates who participate in a high-ability pull-out class, while they themselves are *not* selected to attend this class. When students get to attend a pull-out class, they are explicitly labeled as "highly able." Their status is highly salient as they are 'pulled out' of the regular classroom on a regular basis. Especially when only few students get to attend, this label may foster students' need for competence. Contrarily, not being selected may implicitly communicate to other students that they are not highly able and thereby thwart students' need for competence, especially when many other classmates get to attend the pull-out class. Thus far, little is known about how not being selected and the selectivity of the pull-out class may be associated with students' competence perceptions.

To get a better understanding of how participation in a high-ability pull-out class is associated with students' need for competence for students who are and who are not selected for participation, we first compared competence satisfaction and frustration of students participating and *not* participating in a pull-out class while controlling for academic achievement (between-student comparison). Second, it was examined how the selectivity of the high-ability pull-out class (i.e., the number of students in the regular class that gets to attend the pull-out class) was related to students' need for competence in the regular class, both for students who are and who are not participating in a pull-out class. Third, we investigated whether competence satisfaction and frustration of pull-out students differed between their regular class and pull-out class and whether their need for competence was less satisfied or more frustrated in the high-ability pull-out class because of the comparison to other high-ability peers (within-student comparison).

In all, the present study aims to provide more insights into how comparisons with peers may affect primary school students' need for competence. Thereby, the present study aims to contribute to self-determination theory by providing more insights into reference group effects concerning students' need for competence. Besides, previous research on reference group effects has thus far mostly focused on full-time high-ability grouping (e.g., Marsh et al., 1995; Preckel et al, 2010). By focusing on pull-out classes, the present study provides more insights into reference group effects in the context of parttime high-ability grouping where students have multiple comparison groups to which they can compare their abilities.

1.1. Social comparisons

As already posited by social comparison theory in the 1950s, people feel the drive to evaluate their own abilities (Festinger, 1954). They prefer doing this by using objective standards, but when these are not available, they will compare themselves with others (Festinger, 1954). In school, social comparisons play an important role in students' perceptions of their own competence (Gremmen et al., 2018). When children reach late childhood (age 8–10), they have developed the ability to use social comparison information to evaluate themselves. Before this age, children do not yet have this ability to relate evaluations of themselves and others (Harter, 2012). In fact, in upper primary school, reference group effects are the most importance source for students' evaluations of themselves. That is, children primarily base their competence perceptions on comparisons with others (Harter, 2012). In fact, they pay more attention to how their performance compares to that of their classmates than to how their performance compares to their past performance (Gremmen et al., 2018; Webb-Williams, 2021).

In self-determination theory, it has scarcely been examined how students' comparisons with their classmates affect their need for competence. Yet, there is abundant research on students' *academic self-concept*. Academic self-concept is assumed to develop socially. That is, research on academic self-concept indicates that students compare their abilities to others which, in turn, affects their perceptions of their own abilities (e.g., Koivuhovi et al., 2020; Marsh et al., 2008). The construct of academic self-concept bears a strong conceptual resemblance to competence satisfaction (Deci et al., 1991). Academic self-concept refers to students' perceptions of their academic competence and their expectations of academic success and failure (Harter, 2012; Marsh et al., 2008). Likewise, competence satisfaction involves feeling effective and capable to achieve desired outcomes (Chen et al., 2015). Hence, both constructs concern students' perceived capabilities with regard to their academic competence. Several scholars who have put forwarded integrated models combining different motivational theories (e.g., Feldon et al., 2019; Hattie et al, 2020; Vu et al., 2021) have stated that academic self-concept and need for competence, amongst other similar concepts (e.g., expectations of success, [Eccles & Wigfield, 2002], perceived control [Skinner et al., 1990]), overlap significantly and belong to "the same conceptual family" (Hattie et al., 2020, p. 2). Given the resemblance between both concepts, research on reference group effects concerning academic self-concept may provide relevant insights into how reference group effects may affect students' need for competence as similar mechanisms may be at play. As such, we draw on research on academic self-concept to derive the hypotheses for the present study.

Research on academic self-concept suggests students can compare themselves with other students in two ways. First, students can compare their individual achievement to the achievement of their classmates (Marsh, 1987). Second, students can compare the achievement of the group to which they belong with the achievement of other groups (Arens & Watermann, 2015). Both types of comparisons are discussed below.

1.2. Big-fish-little pond effects

When students compare their individual achievement to the achievement of their classmates, a *big-fish-little-pond effect* could occur (Marsh, 1987). This phenomenon entails that higher-achieving students who are surrounded by other highly able classmates tend to have lower academic self-concepts than when they are surrounded by relatively less able classmates. This means, for example, that a high-ability student will have a higher self-concept when surrounded by mixed-ability classmates

as the comparison with classmates indicates that this student is among the best in his or her class (i.e., "a big fish"), but lower self-concept when he or she is in a high-ability class and is no longer one of the best students in the class.

Several studies have shown the big-fish-little-pond effect by demonstrating that class-average achievement is negatively related to students' academic self-concept, after taking into account individual achievement (Areepattamannil et al., 2017; Fang et al., 2018; Goetz et al., 2008; Liou, 2014; Szumski & Karwowski, 2015; Wouters et al.,2015). Similar findings were obtained for students' math and verbal self-concepts (Fang et al., 2018; Pinxten et al., 2015; Roy et al., 2015). Other studies examined big-fish-little-pond effects by focusing on the effects of tracking. Tracking refers to the practice of allocating students full-time to different educational track based on abilities. In many countries, including the Netherlands, students in primary education are taught in mixed-ability classrooms, but are allocated to different tracks from secondary education onward (Van de Werfhorst, 2019). Although tracking differs from high-ability grouping in primary education, in which case only the high-ability students are taught together in homogeneous groups (either part-time or full-time), the underlying mechanisms of social comparison are similar. Results of studies on tracking also provide support for the big-fish-little-pond effect as findings indicate that students who attend higher tracks, and thus have more academically able classmates, report lower self-concept than students in lower tracks, while controlling for academic achievement (Dumont et al., 2017; Liem et al., 2013; Seaton et al., 2011).

Similarly, other studies indicated that full-time high-ability grouping is associated with lower academic self-concept (e.g., Marsh et al., 1995). A review study based on qualitative studies from the perspective of self-determination theory (White et al., 2021) examined how social comparisons affect students' need for competence. Aligning with research on big-fish-little-pond-effects for academic self-concept, they indicated that when students have more competent classmates in physical education, their need for competence is less satisfied than when they have less competent classmates to compare themselves to.

1.3. Assimilation effects

Students do not only compare their individual achievements to classmates. They also compare the achievement of the group to which they belong to the achievement of other groups (Arens & Watermann, 2015; Marsh et al., 2000). The *assimilation effect*, also known as the *reflected glory effect*, entails that belonging to a high-ability group can positively affect students' self-perceptions. For example, a students who gets to participate in a high-ability classes might infer that because they are part of this high-ability group, they themselves also possess a higher level of ability (Marsh et al., 2000; Preckel & Brüll, 2010). This results in these students having more positive perceptions of their abilities compared to their peers not participating in these classes. To illustrate, Herrmann et al. (2016) compared high-ability students in regular classes within the highest academic track of secondary school to high-ability students in special gifted classes within the same track, while controlling for IQ. Students in gifted classes reported higher academic self-concepts in math than similar students in regular classes. The authors ascribed this finding to the occurrence of an assimilation effect.

Both assimilation and big-fish-little-pond effects could happen simultaneously and can counteract each other (Preckel & Brüll, 2010). Studies typically find that the big-fish-little pond effect outweighs the assimilation effect, although there is great variation between studies (Herrmann et al., 2016). The way that ability grouping is organized may account for these differences. Arens and Watermann (2015) suggested that the strength of the assimilation effect depends on the salience of students' group membership. Group membership is salient when students are constantly reminded of the prestige and standing of the group to which they belong and when they have regular interactions with students who belong to other ability groups. To illustrate, one study involving secondary school students (Chmielewski et al., 2013) showed that the assimilation effect was only significant when secondary school students were tracked on ability on a course-by-course basis, but not when students were grouped full-time in a high-ability track. The authors explain their finding by the salience of the reference group. That is, students who were assigned to high or low-ability classes for certain courses only are confronted with students in different tracks on a day-to-day basis and thereby constantly reminded of the relative status in their track. Hence, this is argued to result in students in high-ability classes having higher self-concepts than students in low-ability classes. We posit that a similar process may occur for primary school students in pull-out classes: switching between the regular mixed-ability class and high-ability pull-out class may make their membership of the high-ability group more salient and strengthen the assimilation effect.

1.4. Reference group effects concerning part-time ability grouping

Very few studies have focused on part-time ability grouping. Zeidner and Schleyer (1998, 1999) compared the effects of full-time and part-time high-ability grouping. They compared a group of primary school high-ability students in part-time pull-out classes with a group of high-ability students in full-time high-ability programs. The students in part-time high-ability pull-out classes had substantially higher academic self-concepts than the students in full-time high-ability programs. Their findings may be explained by the assimilation effect: the students in the pull-out classes were switching between their regular class and pull-out class, making their 'membership' of the high-ability group very salient. In contrast, the high-ability students in full-time high-ability programs were only surrounded by other high-ability students due to which the assimilation effect might not counterbalance the big-fish-little-pond effect. A study by Hornstra et al. (2017) corroborates this. They examined the emotions students typically experience in class, including pride, and compared high-ability students in regular mixed-ability classes, in full-time high-ability classes (attended five days a week), and in part-time high-ability classes (attended one day a week). They found that high-ability students in pull-out high-ability classes reported higher levels of pride than high-ability students in full-time high-ability programs and high-ability students who only attended a regular mixed-ability class.

1.5. Comparisons between groups of students and within students

Most studies described above have examined the effects of ability grouping on students' academic self-concept by making comparisons *between* groups of students. Makel et al. (2012) suggested that reference group effects can also be examined by how students' academic self-concept varies across different educational contexts. In other words, by making comparisons *within* students. In their study, they did not find differences in academic self-concept of middle- and high school students in a regular class before entering a high-ability summer program, during the program, and in a regular class six months after the program. Likewise, Dai and colleagues (2013) followed students who attended a gifted summer program for 3 years, and they also did not find a decline in students' academic self-concept after they started participating in the program. These findings could imply that the big-fish-little-pond effect and assimilation effect counterbalanced each other.

In contrast, aligning with the big-fish-little-pond effect, other studies relying on within-student comparisons have shown that students' academic self-concept declined when students moved from a regular mixed-ability class to a full-time high-ability program. This was found for primary school students during the first year after entering a high-ability program (Marsh et al., 1995) as well as for secondary school students during the first half of the school year (Preckel et al., 2010). Similarly, students' academic self-concept increased after students transitioned from a higher to a lower track in high school, compared to equally able students who remained in the same track (Wouters et al., 2012). A qualitative study indicated that primary school students started feeling

more insecure about their abilities after entering a high-ability program because they were no longer at 'the top' of the class (Moon et al., 2002). Hence, most of these findings suggest that when high-ability students move from a setting with students of mixed abilities to a setting with high-ability peers, their academic self-concept declines because students start to compare their ability to their high-ability classmates.

In the aforementioned studies making comparisons within students, students moved from or to a full-time high-ability group. Yet, high-ability students in pull-out classes attend two classes with two different groups of classmates for an extended period. As such, they can compare their achievement to their classmates in the regular mixed ability class, but also to their classmates in the high-ability pull-out class. As a result, their competence perceptions may be based primarily on one of the two reference groups, on an aggregate of both groups, or their competence perceptions may differ across the two contexts that they navigate between. Prior research on domain-specificity of academic self-concept has given indications that students' competence perceptions can differ across different subject domains because students compare their academic achievement with that of their peers in a specific domain (Brunner et al., 2010; Karimova & Csapó, 2020; Lohbeck & Möller, 2017; Marsh & Hau, 2004; Skaalvik & Skaalvik, 2002). Likewise, for students attending a high-ability pull-out class, their perceptions of their competence may also differ between the regular mixed-ability class and their pull-out class as these students can compare their abilities to two distinct reference groups. That is, a high-ability student may have a more positive perception of their competence in the regular class than in the pull-out class, because they have a relatively high academic standing in their regular class. In contrast, in the high-ability pull-out class, they can only compare themselves to other highly able peers, which could make this student feel less competent because they are no longer 'the big fish' in the class. Given that students in a high-ability pull-out class have two distinct reference groups, pull-out classes offer the unique opportunity to simultaneously examine the difference in students' perceptions of their competence both *between* students (those participating and those not participating in a high-ability pull-out class) and *within* students (perceptions of competence in the high-ability pull-out class and regular mixed-ability class).

1.6. Not swimming with the big fish

Differences in competence perceptions between students who are and who are not selected for a high-ability pull-out class may also arise because students may be negatively affected by *not* being selected. There are some indications for this to be happening, although students who are not selected for a high-ability pull-out class are often not included in prior studies. A study among Chinese students showed that students who were assigned to an English course for "ordinary learners", had markedly lower perceptions of their competence than would be expected based on their test scores, compared to those assigned to a course for "advanced learners" (Feng & Wang, 2018). This labeling effect could also take place among students in primary schools which offer high-ability pull-out classes. Moreover, feelings of rejection can lead to need frustration and lower competence beliefs (Gerber & Wheeler, 2009). Not being allowed to attend a pull-out program may be perceived as a rejection and thereby, thwart students' need for competence. Hence, when primary school students are not selected to participate in a high-ability pull-out class, they may infer that they are not highly able and in turn have lower perceptions of their competence.

1.7. Selectivity of the high-ability pull-out class

Perceived class status has been found to be associated with the strength of the effects of high-ability grouping on students' perceptions of their competence (Marsh et al., 2000; Trautwein et al., 2009). That is, assimilation effects are stronger when a class has a higher status. Trautwein et al. (2009), for example, found that students in advanced learner classes had lower self-concept due to the big-fish-little-pond effect, but this effect was reduced when the class was perceived to have a higher status (i.e., a stronger assimilation effect). As such, students who participate in a high-ability pull-out class that only few students get to attend may feel that the pull-out class has a higher standing, and therefore feel more special that they are selected for pull-out class. This is supported by a qualitative study that shows that primary school students in a highly selective pull-out program for high-ability students feel smarter and experience feelings of pride because they get to participate in the program (Moon et al., 2002). These students also had higher self-concepts, and according to their teachers and parents, this could be attributed to feelings of being special to participate in the program. In contrast, the message of *not* being selected might become even more unpleasant for students when many classmates get to attend a pull-out class and they do not. It may evoke a big-fish-little-pond effect as it signals to those students who do not get to participate that they have a lower academic standing in the class, as all those selected are all "highly able" while they are not. To our knowledge, the effects of selectivity of a high-ability pull-out class on students' competence perceptions have not yet been examined in prior research.

1.8. Multidimensionality: Competence satisfaction and competence frustration

In self-determination theory, scholars have argued that each dimension of need satisfaction, including competence satisfaction, can be distinguished from a corresponding dimension of need frustration (Vansteenkiste & Ryan, 2013). This means that competence satisfaction and competence frustration are two distinct constructs which are not just two opposites on the same continuum. Competence frustration can be defined as feelings of failure and doubts about one's competence (Chen et al., 2015). Example items are "*I am often disappointed in my performances*" (competence frustration, e.g., Chen et al., 2015), and "*I feel I can successfully complete difficult tasks*" (competence satisfaction, e.g., Chen et al., 2015). While need frustration by definition involves low need satisfaction, low need satisfaction does not necessarily imply need frustration (Vansteenkiste & Ryan, 2013). This implies that students whose need for competence is not optimally satisfied, do not necessarily also experience competence frustration.

Competence satisfaction and frustration are predictive of different types of outcomes. Competence satisfaction has been found to yield positive consequences, such as increased performance, whereas competence frustration has been related to negative outcomes such as passivity and ill-being (Vansteenkiste & Ryan, 2013). In the present study, we examined whether (not) participating in high-ability pull-out classes may have unique effects on competence satisfaction and competence frustration. For example, not participating in a high-ability pull-out program may not only be associated with lower competence satisfaction but also be related to more competence frustration.

1.9. The present study

This study aims to investigate how participation in a high-ability pull-out class is related to primary school students' need for competence. Empirical research on academic self-concept shows that students' perception of their competence in academic situations rely strongly on comparisons with others (Marsh et al., 1995; Preckel et al., 2010; Zeidner & Schleyer, 1998, 1999). Given the resemblance between academic self-concept and self-determination theory's construct of need satisfaction, students' need for competence may also be dependent on such reference group effects. The present study aims to contribute to self-determination theory by examining how (not) participating in a high-ability pull-out class is associated with primary school students' need for competence. High-ability pull-out classes provide the unique opportunity for this research as students in pull-out classes navigate between two educational contexts with two different reference groups to

which they can compare their abilities: their high-ability classmates in the pull-out class and their mixed-ability classmates in their regular class.

First, we compared primary school students' need for competence between groups (students attending and *not* attending a high-ability pull-out class), while controlling for individual and class-average achievement. By distinguishing competence satisfaction and frustration we could examine whether non-participating students might feel a lower sense of competence satisfaction compared to pull-out students, but also whether they experienced more frustration of their need for competence because of not being selected to participate in a pull-out class. Second, we took into account the effects of the selectivity of the high-ability pull-out class (i.e., proportion of students selected) on students' need for competence. Third, we compared the need for competence of pull-out students across contexts (regular and pull-out class). More specifically, we examined if pull-out students experienced less competence satisfaction when they were being surrounded by other high-ability students, but also whether this may have also evoked feelings of failure (i.e., competence frustration).

Drawing on research on academic self-concept, the following hypotheses were formulated:

1. Students participating in a high-ability pull-out class (hereinafter: pull-out students) report higher need satisfaction and lower need frustration than students *not* participating in a pull-out class (hereinafter: non-participating students), while controlling for academic achievement.
2. A higher proportion of students participating in a high-ability pull-out class is associated with less need satisfaction and more need frustration of all students (pull-out students *and* non-participating students).
3. The need for competence of pull-out students is less satisfied and more frustrated in their high-ability pull-out class than in their regular class.

Considering the benefits of satisfaction of the need for competence (Vansteenkiste & Ryan, 2013), it is not only important to look at the immediate effects of high-ability pull-out classes, but also to investigate the consequences of (not) participating in a high-ability pull-out class over time. Therefore, the persistence of all the above-mentioned associations was explored by examining how high-ability pull-out class participation was associated with students' need for competence one year later, while controlling for students' initial need for competence.

2. Methods

2.1. Dataset and participants

The data was collected at 11 schools which were all participating in the educational research lab POINT (Dutch abbreviation for 'Adequate Education for Every New Talent'). in which primary schools collaborate with universities to conduct practice-oriented research with regard to educating high-ability students. In this educational research lab, participating teachers and researchers came up with several questions to gain more insights into motivational characteristics of high-ability students and teacher strategies to offer optimal support to these students. This resulted in a dataset consisting of a large set of variables collected from teachers and students in regular and pull-out classes, which focused on teaching practices, students' need satisfaction, motivation, and various other student characteristics. The participating schools were all characterized by a school population with a relatively high socio-economic status and few minority students. The data were collected across two waves in two consecutive schoolyears.

The data were used to answer the schools' questions by means of school-specific reports making comparisons across the different schools and the dataset was also intended to be used for scientific papers concerning these questions. Three papers have been published using data from this dataset. This includes a study on teachers' motivating teaching strategies in regular classes and how this is associated with high-ability students' and other students' motivation for school (Hornstra et al., 2020), a study on sensory processing sensitivity among high-ability students (Samsen-Bronsveld et al., 2022), and a study on teachers' need support in regular and pull-out classes (Hornstra et al., 2022). As this dataset also contained information about high-ability students' and their classmates' need for competence in regular classes and pull-out classes, it provided a unique opportunity to answer the questions underlying the present study. The previous papers had different foci and only included a single measurement, whereas the present study makes a comparison across settings (regular and pull-out classes) and utilizes data from both waves.

At the first measurement wave, the sample consisted of 1,975 Dutch primary school students ($M_{age} = 9.83$, $SD = 1.20$, 50.1 % girls) who were in Grade 3 to 6 from 11 primary schools. At the second wave, the sample consisted of 1,496 students because Grade 6 students from the first wave had left primary school. Teachers indicated that 221 students (10.9 %), attended a pull-out class for high-ability students within their school, 35.7 % of the pull-out students were girls. In addition to Dutch ethnicity, 13.3 % of the students from the full sample, and 6.6 % of the pull-out students identified themselves with a second ethnicity (e.g., Moroccan, Surinamese). These findings suggest an underrepresentation of girls and minority students, which has also been found in prior research in various countries (e.g., Bianco et al., 2011; Erwin & Worrell, 2012; Ford, 2014).

2.2. Pull-out classes

All eleven schools in the present study offered a pull-out class for high-ability students. The participating students attended a pull-out class for 2–3 hours per week during regular school hours. The rest of the school week, they attended a regular mixed-ability class. The pull-out classes aimed to provide high-ability students a more challenging learning environment and the opportunity to interact with like-minded peers. The content of the pull-out class was domain-general and focused on general enrichment (Hornstra et al., 2022). These pull-out classes were aimed for students with above-average cognitive abilities who were high performing and ahead of their peers. Selection for the pull-out classes was based on students' prior achievement, measures of cognitive abilities, and teacher observations. The exact criteria could differ per school (Hornstra et al., 2022). Data from the standardized achievement tests shows that students in the high-ability pull-out class performed significantly better than their classmates in their regular class (reading comprehension, Cohen's $d = 1.18$; math: Cohen's $d = 1.18$). Moreover, 66.5 % of pull-out class students were classified as being gifted by a certified clinician or suspected to be gifted by their regular class teacher versus 3.2 % of the students who did not attend a pull-out class.

2.3. Procedure

The research project was approved by the local Ethical Review Board. Consent for the data collection was obtained from parents and teachers, and assent was obtained from the students. Data collection for the first wave took place in February and March 2018 and for the second wave one year later. The duration of this interval was based on considerations for the larger project as well as practical considerations, but this interval also fitted the purpose of the present study as we were interested in the longer-term persistence of the effects of participating in a pull-out class on students' need for competence. Before data collection, teachers reported demographic information of each participating student, indicated whether the student participated in a pull-out class, and reported students' most recent achievement scores on standardized tests. Thereafter, a research assistant visited the schools and students filled out questionnaires during regular class. These questionnaires contained questions on, amongst others, competence satisfaction and

competence frustration. Pull-out students filled out the questionnaires for both the regular and pull-out class. In most schools, the questionnaires were administered digitally: 75 % of the students filled out the questionnaires on a laptop, using the platform LimeSurvey. The other 25 % of the students filled out the questionnaires on paper.

2.4. Instruments

2.4.1. Competence satisfaction and competence frustration

At both waves, students filled out the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2015). The BPNSFS consists of six subscales corresponding to the satisfaction and frustration of the three psychological needs of autonomy, relatedness and competence. Only the data on the subscales for competence satisfaction and competence frustration were included in this study. The two subscales both consisted of four items—eight items in total—which students filled out on a five-point Likert scale (e.g., satisfaction: "*I am able to achieve my goals*", frustration: "*I am often disappointed in my performance*").

To examine whether competence satisfaction and competence frustration could be distinguished into two separate factors, confirmatory factor analyses were conducted in Mplus (version 8.5, Muthén & Muthén, 2017). We used the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) to evaluate model fit. A TLI and CFI value above 0.90 and an RMSEA and SRMR value below 0.08 indicate acceptable model fit (Geiser, 2012; Sharma et al., 2005). Additionally, a chi-square difference test was used to statistically compare the one-factor model to the two-factor model (Geiser, 2012). The two-factor model fitted the data better than the one-factor model, both in the first wave: $\Delta\chi^2(1) = 142.93$, $p < .001$, as well as in the second wave: $\Delta\chi^2(1) = 181.96$, $p < .001$. This means that competence satisfaction and competence frustration can be considered to be two distinct constructs. However, not all of the model fit indices of the two-factor model were acceptable (see Table 1). When model fit is poor, modification indices can be used to determine which parameters to add to the model to significantly improve the model fit (Brown & Templin, 2022). As Brown and Templin (2022) suggest, modification indices for all constrained paths were therefore calculated and the most significant ones were added to the model. Brown and Templin (2022) emphasize that during this process, researchers need to carefully consider the substantive implications for each potential modification. Therefore, based on modification indices and substantive reasons (similarities in content), we correlated error terms of Item 4 ("*I often doubt whether I can do the assignments properly*") with Item 7 ("*I feel insecure whether I can perform well*") and Item 7 with Item 9 ("*I am confident that I can do the assignments correctly*"). This resulted in an acceptable model fit.

Next, to ensure we measured the same underlying constructs across groups and over time, we tested for measurement invariance (Van de Schoot et al., 2012). The following scores were compared: a) pull-out students' scores in the regular vs pull-out class at Wave 1, b) scores in the regular class of pull-out students vs non-participating students at Wave 1, c) scores in the pull-out class of pull-out students at Wave 1 and Wave 2, d) scores in the regular class of pull-out students at Wave 1 and Wave 2, and e) scores in the regular class of non-participating students at Wave 1 and Wave 2. Strong factorial invariance held only for comparison d. For the other comparisons, only partial measurement invariance held, meaning that all factor loadings were equal across the groups, but at least one intercept was variant (see the Online Supplementary Materials for a full description). However, previous research (e.g., Byrne et al., 1989; Pokropek et al., 2019) showed that at least one intercept of the construct—other than the one that is fixed to 1.00—needs to be invariant to reliably compare the constructs across groups or over time, which was the case in our study. When full measurement invariance is not met, sum scores can be biased (Steinmetz, 2013). Therefore, we used factor scores rather than observed mean scores for competence satisfaction and competence frustration in the main analyses, calculated after specifying the right factor structure with partial measurement invariance.

Lastly, the reliabilities of the original competence satisfaction and competence frustration scales were calculated. A Cronbach's alpha of 0.70 is typically the recommended cut-off value (Cho & Kim, 2015; Peterson, 1994; Streiner, 2003). Yet, the acceptable level should depend on the nature of decisions that are made based on these scales (Cho & Kim, 2015). In the present study, the scales were not used for diagnostic purposes or for making decisions about individuals. As such, a lower level of Cronbach's alpha can suffice. Nevertheless, the Cronbach's alphas for each scale were above or approached the commonly recommended cut-off value of 0.70, see Table 2.

2.4.2. Academic achievement

Achievement was measured by scores on tests of the Dutch National Institute for Educational Measurement (CITO) in reading comprehension and mathematics. These tests are highly reliable ($\alpha > 0.80$, Hop et al., 2019; Tomesen et al., 2019). Two different versions of the tests were used by the schools, an older and an updated version. The tests were similar in terms of content and the underlying constructs they intended to measure (see Tomesen et al., 2019), but the scale of the scores of the two versions differed. To account for the different scales of both versions as well as differences between grades, z-scores were calculated per grade and per version. These individual z-scores for achievement were included as control variables in the analyses and aggregated to obtain a score for class-average achievement.

2.5. Data analyses

To examine the research questions, multilevel analyses were conducted in the program Hierarchical Linear Modeling (HLM version 7, Raudenbush et al., 2011) because the data had a nested structure. That is, contexts (regular and pull-out class) were nested within students and students within classes. Of the total sample ($N = 2{,}023$), 147 students (7.3 %) had missing data on the self-report scales at the first wave. Furthermore, students from Grade 6 at the first wave were not included in the data set for Wave 2. Of the remaining 1,496 students, 146 students (9.8 %) had missing data on the self-report scales at the second wave. These missing values at either wave were due to different reasons, including illnesses or when students had transitioned from or to another school. Missing value analyses revealed that those students with a

Table 1
Results Confirmatory Factor Analyses.

Wave	Model	χ^2 (df)	CFI	TLI	RMSEA	SRMR
First	One-factor	415.28 (20)	0.90	0.86	0.10	0.05
	Two-factor	272.35 (19)	0.93	0.90	0.09	0.04
	Two-factor + correlations	122.04 (17)	0.97	0.96	0.06	0.03
Second	One-factor	496.52 (20)	0.86	0.81	0.13	0.06
	Two-factor	314.56 (19)	0.91	0.87	0.11	0.05
	Two-factor + correlations	150.12 (17)	0.96	0.94	0.08	0.04

Table 2
Cronbach's Alpha's for the Competence Satisfaction and Competence Frustration Scales.

	Wave 1		Wave 2	
	Satisfaction	Frustration	Satisfaction	Frustration
Regular class	0.65	0.74	0.77	0.77
Pull-out class	0.74	0.78	0.80	0.84

missing value on one wave did not significantly differ in competence satisfaction or frustration at the other wave from students without missing values (p values > 0.05), and pull-out class students did not differ from other students in the likelihood of having a missing value on any of the variables in the regular class on either wave (p values > 0.05). Moreover, 18 pull-out class students (8.1 %) had completed the questions on competence satisfaction in the regular class, but not the pull-out class, and this was the other way around for five students (2.3 %), whereas 20 pull-out class students (9.0 %) had completed the questions on competence frustration in the regular class, but not the pull-out class, and this was the other way around for 8 students (3.6 %). Missing value analyses indicated that pull-out students with or without missing values in the pull-out class did not differ significantly in scores on competence satisfaction or frustration in the regular class or vice versa (p values $>$ 0.05). Based on these results the missing values were considered to be at random, and full maximum likelihood estimation was therefore used to handle the missing data (Hox et al., 2018).

The assumptions for sufficiently large sample size, absence of multicollinearity and normality of residuals for the dependent variables were met. The facets of competence satisfaction and competence frustration of academic self-concept were included as dependent variables. The assumption of linearity was met for the relations between almost all independent variables and both competence satisfaction and competence frustration but not for the relation between the proportion of students participating in a pull-out class and both facets. Therefore, in the subsequent analyses, we examined whether there was a curvilinear relationship between the proportion and either the facet of competence satisfaction or the facet of competence frustration on top of a linear relationship by adding the quadratic proportion to the model. Also, 15 classes (18.8 %) had a proportion of zero students participating in a pull-out class. We controlled for the classes with a proportion of zero by including a dummy variable of whether or not there were pull-out students in a regular class in the model (1 = no pull-out students, 0 = pull-out students). This way, we could examine the effect of the proportion of pull-out students only for classes in which some students attended a pull-out class.

For the first and second research questions regarding the differences in academic self-concept in the regular class between pull-out students and non-participating students and the effects of the selectivity of the pull-out class, a two-level model was analyzed with students nested within classes. In the first step of the analyses, individual achievement in reading and math were group mean centered and entered into the model as predictors at the student level. Subsequently, class-average achievement in reading and math were included as predictors at the class level. Next, we added the student-level predictor of whether or not students participate in a pull-out class and then the class-level predictor's proportion of students participating in a pull-out class and the dummy-variable absence of pull-out students to the model. Finally, the cross-level interaction between selectivity and participation in a pull-out class was added to the model to explore if selectivity similarly affected pull-out and non-participating students.

For the third research question regarding the differences in academic self-concept between the regular and pull-out class of pull-out students, a two-level model was analyzed with context (regular or pull-out class) nested within students. Class was not included as third level in this analysis, because it was unknown which students were in the same pull-out class. Although the first level only has two units, it was decided to conduct a multilevel analysis because this analysis has two important advantages over a repeated-measures ANOVA. First, multilevel analysis can include incomplete cases, whereas a repeated measures ANOVA uses listwise deletion by default (Hox et al., 2018). Second, multilevel analysis tends to have higher power than repeated measures ANOVA (Fan, 2003).

For the final research question regarding the effects of pull-out classes over time, competence satisfaction and competence frustration at Wave 2 were included as the dependent variables and initial competence satisfaction and competence frustration at Wave 1 were included as covariates. Next, the predictors of the previously described analyses were again included as predictors in the model. For all the analyses, a significance level of $\alpha = 0.05$ was used.

3. Results

3.1. Descriptive statistics and correlations

Table 3 shows the descriptive statistics of the dependent variables and covariates in the present study. For the purpose of interpretation, the observed mean scores are included in the table instead of the calculated factor scores. The intraclass correlations (ICCs) are also included in the table to indicate at what level the variance was situated. When comparing class-level against student-level, the ICCs indicated that almost all variance was situated at the student-level. When comparing student-level against context-level, the ICCs indicated that around 50 % of the variance was situated at the student-level.

Table 4 shows the correlations between the variables of the present study. Note that some student-level variables were aggregated to the class-level for correlations with class-level variables.

3.2. Differences in need for competence between groups

The first hypothesis stated that the need for competence of pull-out students would be more satisfied than the need for competence of their non-participating peers, while controlling for individual and class-average achievement. Table 5 reports the findings for competence satisfaction. For all students, higher individual achievement was associated with higher levels of competence satisfaction, both for reading achievement: $b = 0.08$, $t(1641) = 5.21$, $p < .001$, and for math achievement: $b = 0.19$, $t(1641) = 13.21$, $p < .001$. In contrast to the big-fish-little-pond effect, a higher class-average achievement in reading was associated with higher levels of competence satisfaction, $b = 0.08$, $t(75) = 2.68$, $p = .009$, and math class-average achievement had no significant relation with competence satisfaction, $b = 0.04$, $t(75) = 1.21$, $p = .231$. In line with our hypothesis, the two-level model showed that pull-out students reported higher levels of competence satisfaction in the regular class than non-participating students, $b = 0.21$, $t(1640) = 5.30$, $p < .001$. The effect size for the difference in levels of competence satisfaction was $d = 0.48$, indicating a medium effect (Cohen, 1992).

Comparable results were found for competence frustration, see Table 6. Both individual achievement in reading, $b = -0.09$, $t(1641) = -5.48$, $p < .001$, and individual achievement in math, $b = -0.20$, $t(1641) = -12.59$, $p < .001$, were negatively related to levels of competence frustration. On top of that, class-average achievement in reading was significantly and negatively related to levels of competence frustration, $b = -0.11$, $t(75) = -2.91$, $p = .005$, while the relation between class-average achievement in math and students' reported levels of competence frustration was not significant, $b = -0.05$, $t(75) = -1.22$, $p = .228$. In line with our hypothesis, pull-out students reported lower levels of competence frustration in their regular class than non-participating students, $b = -0.26$, $t(1640) = -5.99$, $p < .001$. The effect size for the difference in competence frustration was $d = 0.46$, indicating a medium effect (Cohen, 1992).

Next, it was hypothesized that higher selectivity of the pull-out class would be associated with higher competence satisfaction for both pull-out students and non-participating students. In regular classes in which no students attended a pull-out class, students reported lower levels of competence satisfaction ($b = -0.12$, $t(73) = -2.42$, $p = .018$), and higher levels of competence frustration ($b = 0.12$, $t(73) = 2.27$, $p = .026$) than students in regular classes with pull-out students. In line with the hypothesis, it was found that for those classes with pull-out students, a higher proportion of students participating in a pull-out class was associated with lower levels of competence satisfaction, $b = -0.60$, $t(73) = -2.56$, $p = .012$, and higher levels of competence frustration, $b = 0.73$, t

Table 3
Descriptive Statistics of the Dependent Variables and Covariates.

	Non-participating students (regular class)		Pull-out students (regular class)		Pull-out students (pull-out class)		*ICC* (Class versus student)	*ICC* (Student versus context)
	M	*SD*	*M*	*SD*	*M*	*SD*		
Wave 1								
Competence satisfaction	3.62	0.67	4.01	0.60	4.08	0.58	0.02	0.55
Competence frustration	2.48	0.80	2.07	0.75	1.86	0.67	0.02	0.57
Achievement reading (z-scores)	−0.11	0.95	0.87	0.91				
Achievement math (z-scores)	−0.11	0.97	0.82	0.77				
Wave 2								
Competence satisfaction	3.55	0.64	3.95	0.57	3.91	0.64	0.04	0.54
Competence frustration	2.55	0.81	2.21	0.74	1.93	0.74	0.03	0.48

(73) = 2.88, p =.005. The curvilinear relations between proportion of students participating in a pull-out class and both levels of competence satisfaction (b = -1.84, t(85) = -0.75, p =.455) and levels of competence frustration (b = 4.15, t(86) = 1.58, p =.117) were not significant. Finally, the cross-level interaction between proportion and participation in a pull-out class was not significant, b = -0.38, t(76) = -0.72, p =.473 (competence satisfaction), and b = 0.77, t(76) = 1.28, p =.204 (competence frustration). This means that the selectivity of a pull-out class had a similar effect on levels of competence satisfaction and competence frustration reported by pull-out students and non-participating students. The total explained variance decreased with ΔR^2 = -0.02 (competence satisfaction) and ΔR^2 = -0.05 (competence frustration) by adding this interaction.

3.3. Differences in need for competence between contexts

The third hypothesis stated that pull-out students' need for competence would differ between the regular and pull-out class. The findings of the two-level model confirmed this hypothesis. However, in contrast to what was expected, students reported higher levels of competence satisfaction, b = 0.10, t(197) = 2.72, p =.007, and lower levels of competence frustration, b = -0.22, t(197) = -5.81, p <.001, in their pull-out class than in their regular class. The effect sizes for the difference in academic self-concept between the contexts were d = 0.09 for competence satisfaction, and d = 0.25 for competence frustration, both indicating a small effect (Cohen, 1992).

3.4. Persistence of the effects

Lastly, we examined the effects of pull-out classes on students' competence need one year later, while controlling for students' competence need at Wave 1. Figs. 1 and 2 show the mean levels of the facets of competence satisfaction and competence frustration at both waves for the different groups and contexts. Note that the figures display the means at both waves only for students who were present at both Wave 1 and Wave 2 (n = 1,496).

First, we examined the differences in students' need for competence one year later between pull-out students and non-participating students, while controlling for initial need for competence, and initial achievement. Table 7 reports the results for competence satisfaction. Both groups of students reported somewhat lower levels of competence satisfaction at Wave 2 compared to Wave 1. This decrease over time was similar for the two groups of students, b = -0.07, t(1069) = -1.42, p =.156, indicating that the difference in levels of competence satisfaction between the two groups of students was similar at Wave 1 and Wave 2. Moreover, the selectivity of the pull-out class did not predict levels of competence satisfaction at Wave 2 when taking into account competence satisfaction at Wave 1, b = -0.31, t(55) = -1.04, p =.305. The total explained variance was R^2 = 0.34.

Table 8 reports the results for competence frustration. Levels of competence frustration increased for both groups of students, but somewhat more for students participating in pull-out classes than for students *not* participating in pull-out classes, b = 0.16, t(1069) = 3.03, p =.003, d = 0.15. This indicates that the difference in levels of competence frustration between the two groups of students has narrowed, the effect size d = 0.40 for this difference suggests a small to medium effect (Cohen, 1992). The effect sizes for the difference in levels of competence frustration between Wave 1 and Wave 2 were d = 0.08 (non-participating students) and d = 0.24 (pull-out students), both indicating a small effect (Cohen, 1992). Moreover, the selectivity of the pull-out class did not predict levels of competence frustration at Wave 2 when taking into account competence frustration at Wave 1, b = 0.43, t(55) = 1.37, p =.176. The total explained variance was R^2 = 0.31.

Regarding the differences in students' need for competence between contexts—i.e., the regular and pull-out class—the two-level model showed that the decrease in levels of competence satisfaction from Wave 1 to Wave 2 was somewhat bigger in the pull-out class than in the regular class, b = -0.11, t(105) = -2.78, p =.007, d = 0.19, over and above initial levels of competence satisfaction, b = 0.49, t(105) = 7.82, p <.001. In contrast to Wave 1, this led to higher levels of competence satisfaction in the regular class than in the pull-out class. The effect sizes for the difference in levels of competence satisfaction between Wave 1 and Wave 2 were d = 0.16 (regular class) and d = 0.25 (pull-out class), both indicating a small effect (Cohen, 1992). The effect size for the difference between the two classes at Wave 2 was d = 0.06, also indicating a small effect (Cohen, 1992). Contrary, the reported levels of competence frustration increased similarly in the two classes from Wave 1 to Wave 2, b = -0.006, t(105) = -0.14, p =.891, over and above initial levels of competence frustration, b = 0.61, t(105) = 7.69, p <.001, indicating that the difference in levels of competence frustration between the two classes was similar at Wave 1 and Wave 2.

4. Discussion

Satisfaction of students' need for competence is important for students' motivation, performance, and development in achievement settings (Deci et al., 1991; Ryan & Deci, 2020). Research from self-determination theory has shown that teachers through their behaviors can impact their students' need for competence (Bureau et al., 2022; Stroet et al., 2013). Yet, research on academic self-concept suggests that social comparisons with classmates can also impact students' perceptions of their competence in academic situations (Marsh et al., 1995; Preckel et al., 2010; Zeidner & Schleyer, 1998, 1999). High-ability pull-out classes are unique in the sense that high-ability students switch between their pull-out class and regular class frequently and therefore have two groups of classmates to which they can compare their ability. To gain more insights into how participation in a high-ability pull-out class was associated with primary school students' need for competence, we compared competence satisfaction and frustration both between students participating and *not* participating in a pull-out class,

Table 4
Correlations Between the Variables of the Present Study.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Individual reading achievement	–													
2. Individual math achievement	0.41***	–												
3. Class reading achievement	n/a	n/a	–											
4. Class math achievement	n/a	n/a	0.08**	–										
5. Participation pull-out class	0.31***	0.30***	n/a	n/a	–									
6. Proportion pull-out students	n/a	n/a	0.04	0.00	n/a	–								
7. Absence of pull-out class	n/a	n/a	-0.09	0.00	n/a	-0.64***	–							
8. Competence satisfaction regular class (wave 1)	0.24***	0.32***	0.20[a]	0.12[a]	0.18***	0.04[a]	-0.18[a]	–						
9. Competence frustration regular class (wave 1)	-0.24***	-0.29***	-0.28*[a]	-0.13[a]	-0.16***	0.12[a]	0.08[a]	-0.56**	–					
10. Competence satisfaction pull-out class (wave 1)	0.11	0.02	-0.15[a]	-0.25*[a]	0.14*	-0.21[a]	-0.11[a]	0.48**	-0.35**	–				
11. Competence frustration pull-out class (wave 1)	-0.11	-0.10	0.03[a]	0.14[a]	-0.20**	0.09[a]	0.20[a]	-0.43**	0.58**	-0.55**	–			
12. Competence satisfaction regular class (wave 2)	0.18***	0.30***	0.14[a]	0.10[a]	0.20***	0.06[a]	-0.20[a]	0.56***	-0.41***	0.42***	-0.33***	–		
13. Competence frustration regular class (wave 2)	-0.15***	-0.23***	-0.22[a]	-0.15[a]	-0.13***	-0.08[a]	0.19[a]	-0.41***	0.50***	-0.24**	0.33***	-0.6***	–	
14. Competence satisfaction pull-out class (wave 2)	-0.07	0.09	-0.11[a]	0.02[a]	-0.04	-0.33*[a]	0.18[a]	0.28**	-0.26**	0.36***	-0.38***	0.56***	-0.36***	–
15. Competence frustration pull-out class (wave 2)	-0.08	-0.02	0.09	0.00	0.00	0.09	-0.12	-0.09	0.19*	-0.24*	0.48***	-0.31***	0.52***	-0.60***

Note. n/a = not applicable, because cross-level correlations are not included in this table. [a] the [a] student-level variable in this correlation is aggregated to the class-level.
*p <.05, **p <.01, ***p <.001.

as well as within students participating in a pull-out class across the two educational contexts.

Overall, our findings suggested that, in line with research on academic self-concept (e.g. Marsh et al., 1995; Preckel et al., 2010; Zeidner & Schleyer, 1998, 1999), social comparisons are also relevant for students' need for competence. Primary school students who were selected to attend a high-ability pull-out class reported higher competence satisfaction and lower frustration than students who did not participate in a high-ability pull-out class, even when controlling for academic achievement. Moreover, students' perceptions of competence were more positive when pull-out classes were more selective (i.e., attended by fewer students), and differences persisted over time. In all, these findings suggest the occurrence of assimilation effects.

Based on prior research that has indicated that students' perceptions of their competence can vary across different subject domains (Brunner et al., 2010; Lohbeck & Möller, 2017; Marsh & Hau, 2004; Skaalvik & Skaalvik, 2002), we expected that pull-out students' need for competence could also differ across their two educational contexts. More specifically, based on studies on the big-fish-little-pond effect stating that students that are surrounded by high-ability peers have lower academic self-concepts than equally able peers that are surrounded by less able students (e.g., Dumont et al., 2017; Liem et al., 2013; Marsh, 1987; Preckel et al., 2010; Seaton et al., 2011; Wouters et al., 2015), we expected that high-ability students would experience more competence satisfaction in their regular class than in their pull-out class. As expected, our findings indicated that competence satisfaction of pull-out students differed across the two settings. Yet, contrary to expectations, their need for competence was more satisfied and less frustrated in the high-ability pull-out class than in the regular class. Hence, pull-out class students felt more effective and able and had less feelings of failure in the pull-out class than in the regular class. While prior research suggests that the confrontation with less able peers may strengthen the assimilation effect (e.g., Arens & Watermann, 2015), this finding suggests that the assimilation effect might actually be stronger *within* the context of the high-ability pull-out class than in the regular class. If the status of the pull-out class is frequently emphasized by the pull-out class teacher or amongst the pull-out class students themselves, this may strengthen students' awareness that they belong to a group of high-ability students. Additionally, other explanations may also account for this finding. Prior research suggests that students in high-ability pull-out classes experience their teachers in the pull-out class as more supportive of their basic psychological needs and the curriculum as more challenging (Hornstra et al., 2022). Moreover, being in contact with like-minded peers (Rinn, 2018; Van Rossen et al., 2021) may also be conducive to high-ability students' psychological needs. Future research could investigate these additional explanations further.

Moreover, as expected based on previous research (Arens & Watermann, 2015; Chmielewski et al., 2013), the findings for the between-student comparison also indicated the occurrence of an assimilation effect. That is, when comparing students that were and were *not* selected to participate in a pull-out class, the pull-out class students were found to feel even more effective and able than their classmates, even after controlling for prior achievement. Although our findings suggest assimilation effects, this does not exclude the possibility that big-fish-little-pond effects may have also occurred, as both assimilation effects and big-fish-little pond effects can occur simultaneously and counteract each other (Preckel & Brüll, 2010). It rather shows that in case of pull-out classes, the assimilation effects may outweigh the big-fish-little-pond effect. As hypothesized, this may be due to the salience of the status of being selected to be in a pull-out program. Future research could examine this further.

Additionally, prior studies have shown that higher perceived class status is associated with higher academic self-concepts (Marsh et al., 2000; Trautwein et al., 2009). Accordingly we expected that when the high-ability pull-out class was more selective, the 'happy few' who were selected would report more competence satisfaction compared to when

Table 5
Models Predicting Students' Levels of Competence Satisfaction.

	Null model		Model 1		Model 2		Model 3		Model 4		Model 5	
Fixed effect	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Intercept	0.04**	0.02	0.05**	0.01	0.02	0.02	0.05	0.02	0.11**	0.04	0.11**	0.04
Indv. reading achievement			0.08***	0.01	0.06***	0.01	0.06***	0.01	0.06***	0.01	0.06***	0.01
Indv. math achievement			0.19***	0.01	0.18***	0.01	0.18***	0.01	0.18***	0.01	0.18***	0.01
Class reading achievement			0.08*	0.04	0.08*	0.04	0.08*	0.04	0.07*	0.03	0.07*	0.03
Class math achievement			0.04	0.03	0.04	0.04	0.04	0.03	0.04	0.03	0.04	0.03
Participation pull-out class					0.21***	0.04	0.22***	0.04	0.22***	0.04	0.29**	0.10
Proportion pull-out students							−0.23	0.18	−0.60*	0.23	−0.55*	0.25
Absence of pull-out class									−0.12*	0.05	−0.11*	0.05
Proportion * participation in pull-out class											−0.38	0.52
Random effects	Variance		Variance		Variance		Variance		Variance		Variance	
σ^2_{u0}	0.006**		0.007***		0.007***		0.007***		0.006***		0.007**	
σ^2_e	0.265		0.222		0.219		0.219		0.219		0.218	
σ^2_{u1}											0.005	
R^2			0.16				0.17				0.15	
					0.17				0.17			

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 6
Models Predicting Students' Levels of Competence Frustration.

	Null model		Model 1		Model 2		Model 3		Model 4		Model 5	
Fixed effect	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Intercept	−0.05**	0.02	−0.06***	0.02	−0.03	0.02	−0.06*	0.03	−0.13**	0.04	−0.11**	0.04
Indv. reading achievement			−0.09***	0.02	−0.07***	0.02	−0.06***	0.02	−0.06***	0.02	−0.06***	0.02
Indv. math achievement			−0.20***	0.02	−0.18***	0.02	−0.18***	0.02	−0.18***	0.02	−0.18***	0.02
Class reading achievement			−0.11**	0.04	−0.11**	0.04	−0.11**	0.04	−0.10**	0.04	−0.09*	0.04
Class math achievement			−0.05	0.04	−0.04	0.04	−0.05	0.04	−0.05	0.04	−0.05	0.04
Participation pull-out class					−0.26***	0.04	−0.28***	0.04	−0.28***	0.04	−0.41***	0.11
Proportion pull-out students							0.36	0.20	0.73**	0.25	0.63*	0.28
Absence of pull-out class									0.12*	0.05	0.11	0.06
Proportion * participation in pull-out class											0.77	0.60
Random effects	Variance		Variance		Variance		Variance		Variance		Variance	
σ^2_{u0}	0.008**		0.007***		0.008***		0.007***		0.006***		0.008***	
σ^2_e	0.327		0.275		0.269		0.269		0.269		0.267	
σ^2_{u1}											0.015	
R^2			0.16		0.17		0.18		0.18		0.13	

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

more students would be selected. Indeed, our findings indicated that when relatively fewer students were selected to participate in a pull-out class, competence satisfaction of pull-out class students was higher. In other words, when it was more special to be selected to participate in a pull-out class, the assimilation effect of being selected on students' competence satisfaction seemed stronger. Equally important, the findings also showed that *not* being selected to participate in a high-ability pull-out class has more negative effects on competence satisfaction when there were higher numbers of classmates who were selected. Hence, depending on the selectivity, even not being selected can affect students' need for competence This latter finding for students who do not get to attend may suggest a big-fish-little-pond effect: when many classmates are participating in high-ability pull-out classes, but they themselves are not, this may signal to students that they have a relatively lower academic standing in the class, resulting in more negative competence perceptions.

Contrary to the effects of selectivity of the pull-out class for non-participating students, and contrary to expectations, the findings for class-average achievement did not indicate a big-fish-pond-effect. Together these findings suggest that in a primary school context, classmates' participation in a high-ability pull-out class is a more salient cue for students on which to base their perceptions of classmates' ability than classmates' achievement scores. That is, the big-fish-little-pond effect assumes that students are aware of their classmates' academic achievement. Especially younger children, like the primary school students in the present study, may not be fully aware of their classmates'

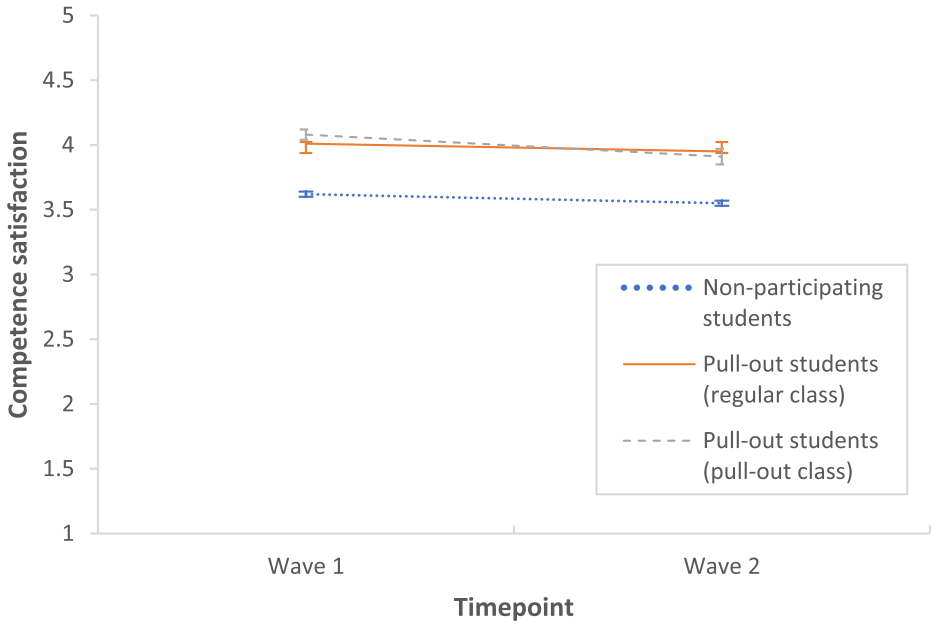

Fig. 1. Observed Means of Competence Satisfaction Over Time.

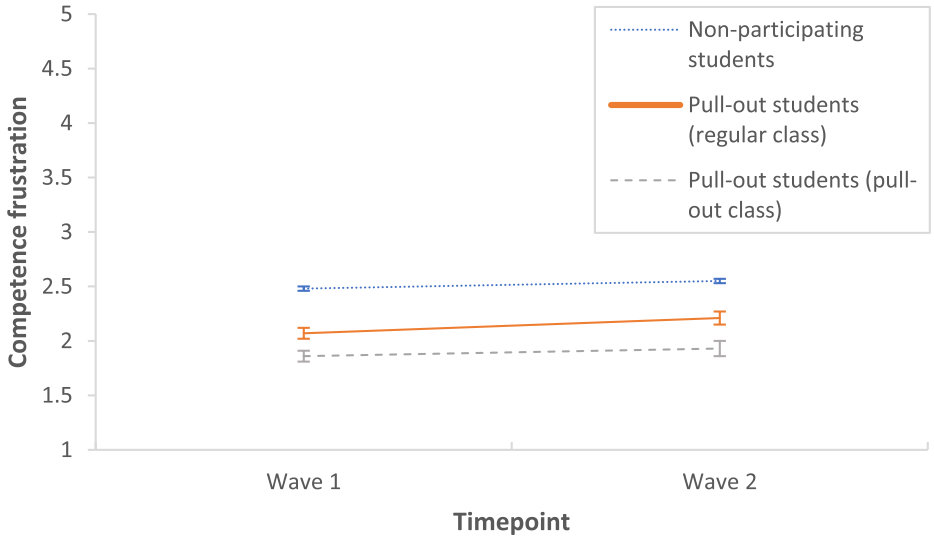

Fig. 2. Observed Means of Competence Frustration Over Time.

achievement. Indeed, the big-fish-little-pond effect has been found to be smaller for primary school students than for high school students (Marsh et al., 2014). Hence, for these students, being selected or *not* being selected may be a more visible indicator of classmates' academic achievement, perhaps more so than classmates' performance on achievement tests.

In contrast to research on academic self-concept, self-determination theory distinguishes between two facets of competence beliefs: competence satisfaction and competence frustration. Our findings suggested that it is better to distinguish competence satisfaction from competence frustration rather than including only one factor. Findings for the two facets were mostly in opposite directions, but there were noticeable differences in effect sizes. For instance, pull-out students reported somewhat higher levels of competence satisfaction ($d = 0.09$) in the pull-out class compared to the regular class, whereas the differences in competence frustration between the two contexts were much more substantial ($d = 0.25$). Also, competence satisfaction and frustration developed differently over time. Whereas the difference in competence satisfaction between the two groups of students remained similar over time, competence frustration in the regular class increased more strongly for pull-out students than for non-participating students. Hence, distinguishing between competence satisfaction and competence frustration revealed unique, rather than just oppositional effects. This may suggest that research on academic self-concept may also benefit from a multidimensional view of the construct.

In all, our findings suggest that for individual students, it seems relatively beneficial to participate in a high-ability pull-out class in terms of their need for competence, as students participating in high-ability classes reported more satisfaction and less frustration of their need for competence. However, when considering the entire group of students, the advantages for students' need for competence were being attenuated when many students participate in a high-ability pull-out class. That is, the larger the number of students who get to attend a pull-out class, the weaker the effects on those who get to attend and this may even lower competence satisfaction of those who do not get to attend the high-ability pull-out program.

Table 7
Models Predicting Students' Levels of Competence Satisfaction at Wave 2 controlling for Competence Satisfaction at Wave 1.

	Null model		Model 1		Model 2		Model 3		Model 4		Model 5	
Fixed effect	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Intercept	−0.09***	0.02	−0.09***	0.02	−0.09***	0.02	−0.08**	0.03	−0.04	0.04	−0.04	0.04
Competence Satisfaction W1			0.56***	0.03	0.56***	0.05	0.56***	0.03	0.56***	0.03	0.56***	0.03
Indv. reading achievement			−0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02
Indv. math achievement			0.06***	0.02	0.06***	0.02	0.06***	0.02	0.06***	0.03	0.06***	0.02
Class reading achievement			−0.00	0.04	−0.00	0.04	0.00	0.04	0.01	0.04	−0.01	0.04
Class math achievement			0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.02	0.04
Participation pull-out class					−0.07	0.05	−0.07	0.05	−0.07	0.05	−0.14	0.13
Proportion pull-out students							−0.07	0.24	−0.31	0.30	−0.35	0.30
Absence of pull-out class									−0.08	0.06	−0.08	0.06
Proportion * participation in pull-out class											0.44	0.77
Random effects	Variance		Variance		Variance		Variance		Variance		Variance	
σ^2_{u0}	0.011***		0.008***		0.008***		0.008***		0.007***		0.007	
σ^2_e	0.278		0.185		0.185		0.185		0.185		0.184	
σ^2_{u1}											0.003	
R^2			0.33				0.33				0.33	
					0.33				0.34			

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 8
Models Predicting Students' Levels of Competence Frustration at Wave 2 controlling for Competence Frustration at Wave 1.

	Null model		Model 1		Model 2		Model 3		Model 4		Model 5	
Fixed effect	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Intercept	0.07**	0.02	0.07***	0.02	0.06**	0.02	0.04	0.03	−0.00	0.05	−0.01	0.05
Competence Frustration W1			0.59***	0.03	0.58***	0.03	0.58***	0.03	0.58***	0.03	0.58***	0.03
Indv. reading achievement			0.02	0.02	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02
Indv. math achievement			−0.04*	0.02	−0.05**	0.02	−0.05**	0.02	−0.05**	0.02	−0.05**	0.02
Class reading achievement			0.01	0.04	0.01	0.04	0.00	0.04	0.01	0.04	0.01	0.04
Class math achievement			−0.02	0.04	−0.02	0.04	−0.02	0.04	−0.02	0.04	−0.02	0.04
Participation pull-out class					0.16**	0.05	0.15**	0.05	0.15**	0.05	0.26	0.14
Proportion pull-out students							0.21	0.25	0.43	0.32	0.50	0.32
Absence of pull-out class									0.07	0.32	0.08	0.06
Proportion * participation in pull-out class											−0.66	0.83
Random effects	Variance		Variance		Variance		Variance		Variance		Variance	
σ^2_{u0}	0.011***		0.008***		0.008***		0.008***		0.008***		0.007***	
σ^2_e	0.318		0.219		0.217		0.217		0.217		0.216	
σ^2_{u1}											0.002	
R^2			0.31				0.31				0.32	
					0.31				0.31			

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

4.1. Limitations and future research

This study has some limitations that need to be noted. First, our hypotheses and explanations are based on theory and empirical research on academic self-concept. While there appears to be strong conceptual resemblance, future research could investigate to what extent measures of students' perceived competence satisfaction and academic self-concept assess distinct or overlapping factors. Second, our hypotheses are derived based on theory concerning the big-fish-little pond effect and assimilation effect. Yet, we did not explicitly measure, for example, salience of class status of the high-ability pull-out class. Therefore, we could not exclude that other factors affected our results. In future research, open-ended questions could be added to the questionnaire to measure these factors, by for example, asking how students compare their achievement to achievement of their peers, asking about the perceived status of the pull-out class, asking students how they feel when being pulled-out of the regular class, or asking those who are not selected for a high-ability pull-out class how they feel about this. Third,

there may have been differences in the implementation of high-ability pull-out classes in different schools. For instance, the weekly frequency of high-ability pull-out class activities may differ across schools. This might affect the salience of classmates' selection for the high-ability pull-out class in the regular class, and thereby the strength of potential assimilation effects. Also, in some schools, high-ability pull-out classes primarily focus on enrichment of the curriculum, while others may for example place more emphasis on metacognitive skills. For future research, it might therefore be interesting to examine the effects of the frequency and curriculum of pull-out classes on students' need for competence. Fourth, future research could further investigate the longitudinal effects of high-ability pull-out classes on students' need for competence. Our longitudinal findings are in line with the study by Liu et al. (2005), who showed that academic self-concept of high-ability students decreases the longer they are grouped on ability. Yet, the present study could only compare students' need for competence at two timepoints. To gain a more complete understanding of how participation in a high-ability pull-out class affects students' need for competence, future research should assess students' need for competence before entering a pull-out class, during participation in a pull-out class, and after ending participation in a pull-out class. Fifth, in order to obtain a fitting model, we needed to correlate error variances. This may have impacted the generalizability of the model. Lastly, the internal consistency of competence satisfaction in the regular class at Wave 1 was slightly lower than the often recommended level of $\alpha > 70$. Nevertheless, Cho and Kim (2015) argue that lower alpha values can suffice when measures are not used for individual decision making or diagnostic purposes, as was the case in the present study.

4.2. Conclusions and implications

The present study was among the first to examine students' need for competence in light of high-ability pull-out classes by making both within- as well as between-comparisons. While the main reason to implement high-ability programs is to fulfill the cognitive needs of high-ability students (Preckel et al., 2010), these programs also affect students' perceptions of their competence. The present study indicates that being selected or *not* being selected may be a highly salient cue for academic achievement in primary school which in turn is related to students' competence perceptions. The need for competence of students that are being selected to participate in a pull-out class was relatively more satisfied and less frustrated than the need for competence of students that were *not* selected to participate in a pull-out class, even after controlling for prior achievement.

Based on research on full-time programs, it is often feared that the cognitive benefits of high-ability classes may come at the expense of students' perceptions of their competence (e.g., Vogl & Preckel, 2014). The findings of the present study suggest that this is not the case for part-time pull-out classes. On the contrary, in the present study it was found that students participating in pull-out classes reported even higher competence satisfaction than students not participating, even after controlling for achievement. If this finding is corroborated by future research, educators may take the possible benefits of part-time high-ability programs for high-ability students' competence satisfaction into account when considering students for participation in either part-time or full-time high-ability programs.

Additionally, oftentimes, research about educational interventions only focuses on the effects of these interventions on students participating in them. The findings of the present study suggest that *not* participating could also have consequences. These consequences may be dependent on the selectivity of the intervention and possibly also how being selected or *not* being selected to participate is determined and communicated. Feelings of exclusion or rejection could have negative effects such as less competence satisfaction, more competence frustration, or decreased motivation. Therefore, for future research and educational practitioners, it is important to account for the consequences of interventions for students that do *not* get to "swim with the big fish" and carefully consider the way selection and communication takes place. This way, fulfilling the cognitive needs of some students does not have to be at the expense of other students.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgement

We would like to thank the pupils, their parents, and teachers who participated in this study. We especially thank the schools and participants of the POINT educational lab for their cooperation in this study. This work was supported by the Nationaal Regieorgaan Onderwijsonderzoek [NRO 405-16-627].

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cedpsych.2023.102171.

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