frontiers | Frontiers in Education

TYPE Original Research
PUBLISHED 06 March 2023
DOI 10.3389/feduc.2023.1006009

OPEN ACCESS

EDITED BY
Christi Underwood Edge,
Northern Michigan University,
United States

REVIEWED BY
Michael DiCicco,
Northern Kentucky University,
United States
Tova Michalsky,
Bar-Ilan University,
Israel

*CORRESPONDENCE
Yehudit Judy Dori
✉ yjdori@technion.ac.il

SPECIALTY SECTION
This article was submitted to Teacher Education, a section of the journal Frontiers in Education

RECEIVED 09 August 2022
ACCEPTED 16 January 2023
PUBLISHED 06 March 2023

CITATION
Dori YJ, Goldman D, Shwartz G, Lavie-Alon N, Sarid A and Tal T (2023) Assessing and comparing alternative certification programs: The teacher-classroom-community model. *Front. Educ.* 8:1006009. doi: 10.3389/feduc.2023.1006009

Assessing and comparing alternative certification programs: The teacher-classroom-community model

Yehudit Judy Dori[1,2]*, Daphne Goldman[3], Gabriella Shwartz[1], Nirit Lavie-Alon[1], Ariel Sarid[3] and Tali Tal[1,2]

[1]Technion Israel Institute of Technology, Haifa, Israel, [2]Samuel Neaman Institute for National Policy, Haifa, Israel, [3]Beit Berl College, Kfar Saba, Israel

Alternative certification programs (ACPs) differ from traditional teacher certification programs in their target populations, duration, tools they employ, their pedagogy, and subject matter curricula. Given the acute shortage of excellent teachers, especially in STEM, significant efforts and resources are invested in ACPs so they prepare highly qualified teachers. Yet, novice teachers face difficulties during their initial integration into the school system. To better understand the state of affairs, we investigated and compared the integration into the school system of graduates of five major Israeli ACPs that are tailored for diverse student-teacher target audiences. The study goals were to (1) investigate and compare the integration of graduates of the five ACPs into the teaching profession with respect to five teacher-related aspects: (a) self-efficacy, (b) commitment to the teaching profession, (c) challenges encountered, (d) leadership roles, and (e) teamwork; (2) identify ACP characteristics that support the graduates' integration into the teaching profession. The teacher-classroom-community model we propose, holistically connects three aspects: affective – the teacher, the teaching profession – the classroom, and peer interaction and leadership – the school community. The model provides a common language for comparing how the different ACPs prepared their graduates toward the teaching profession. The model is instrumental for identifying ACP characteristics that support graduates' integration into teaching and facilitating ACP evaluation by connecting several aspects of teachers' professional lives. The study employed a mixed-methodology in which 506 graduates responded to a closed- and open-ended questionnaire and 71 interviews were conducted with graduates (novice teachers), ACP directors, school principals and mentor teachers. The findings depict a complex picture that reflects the different ACPs' characteristics targeted at diverse audiences. For example, graduates of STEM-oriented programs perceive the different kinds of knowledge, including content knowledge, pedagogical knowledge, and pedagogical content knowledge, as most important to their roles in schools. They undertake fewer roles, and the ones they do assume are discipline-related. Graduates of the more social-leadership-oriented programs identify developing leadership skills as most beneficial and they undertake more leadership-related roles. The research highlights key aspects that teacher education leaders should consider and use for self-evaluation of their ACPs. The strength of this study stems from proposing and applying the teacher-classroom-community model for evaluating teacher certification programs in several contexts and for diverse groups along with their integration into schools.

KEYWORDS

teacher certification programs, alternative certification programs, teaching profession, integration into schools, the teacher-classroom-community model

Introduction

Alternative certification programs (ACPs) have ceased to be marginal in education systems (Brantlinger and Smith, 2013; Edmondson et al., 2022) but they are less common in Europe (Carver-Thomas and Darling-Hammond, 2019; Werler and Tahirsylaj, 2020). ACPs are designed to attract people into the teaching profession, and commonly are shorter than traditional programs. Other differences between ACPs and traditional teacher certification programs (TCP) include the tools provided to graduates, and emphasis on pedagogy and subject matter curricula (Karge and McCabe, 2014; Darling-Hammond, 2016). ACPs vary considerably-what is classified in one state or country as alternative certification is considered a traditional program elsewhere (Aragon, 2016). ACPs in science, technology, engineering, and mathematics (STEM) education need special attention given the lingering worldwide shortage of STEM teachers (Edmondson et al., 2022).

Prompted by the establishment of various national-level ACPs in Israel, we set out to understand their influence on their graduates. These programs, referred to as *unique teacher certification program*(s), aim at "attracting high quality professionals and/or offering a second career to individuals with industrial and hi-tech experience in response to shortage of teachers in some fields" (Ministry of Education, in Hebrew)[1]. These programs are not necessarily shorter than traditional undergraduate or post-graduate TCPs.

Current studies of such programs reflect specific goals of teaching and learning (Richmond et al., 2019). For example, some studies focus on teachers' knowledge and skills acquired in the program, while others focus on student performance or on the school environment (Avargil et al., 2013; Thomas, 2018). This poses a dilemma, as programs strive to achieve diverse goals, leading to lack of coherence among programs and teachers graduating with different types of knowledge, skills, beliefs, and classroom experience (Tatto et al., 2016; Bartell et al., 2019). To assess the integration of graduates of the ACPs into the teaching profession, we propose a teacher-classroom-community model (see following), which encompasses a broad scope that views the teacher holistically, as an active component of the educational system. It is based on the premise that TCPs and ACPs and the teachers who graduate from them should be evaluated in three contexts: affective aspects, such as teachers' self-efficacy (Kahveci et al., 2018), performance in the classroom (Darling-Hammond et al., 2012), and interactions with the school community (Hunzicker, 2017). Despite diversity among the ACPs operating in Israel, each with particular professional objectives, all generally aim at preparing high-quality teachers that will serve as agents-of-change in the educational system. The model proposed here is specifically tailored to holistically assess the effects of ACPs on graduates. It aspires to close the current gap in modeling ACPs in terms of various attributes, including focus, enrolled student population, duration, graduates' integration into the school system, and the quality of the integration process. Diversity in ACP attributes offers a fruitful substrate to compare among the various ACPs. Moreover, our model can be applied to traditional programs as well.

Due to the acute shortage of excellent teachers in subjects of high demand, especially in STEM (Edmondson et al., 2022), significant efforts and resources are invested in these ACPs. Yet, novice teachers face challenges during their initial integration into the school system (Fresko and Nasser-Abu Alhija, 2009; Wong and Luft, 2015; Shwartz and Dori, 2020).

With this in mind, in this research, we assessed and compared five major national-level ACPs that are tailored for diverse target audiences, aiming to prepare them to become highly qualified teachers and leaders in the school community. We propose a suitable, holistic teacher-classroom-community model for evaluating the impact of ACPs (elaborated in the Theoretical Background).

The goals of this study were:

(1) Investigating and comparing five major ACPs conducted in Israel and their graduates' integration into the teaching profession with respect to the following five teacher-related aspects: (a) self-efficacy, (b) commitment to the teaching profession, (c) challenges encountered, (d) leadership roles, and (e) teamwork.
(2) Identifying ACP characteristics that support graduates' integration into the teaching profession.

The contribution of this study is in its presentation of the teacher-classroom-community model and its application to assessing and comparing five ACPs in several contexts and for diverse audiences. The model is instrumental for identifying ACP characteristics that support graduates' integration into the teaching profession, and it facilitates the evaluation of ACPs by connecting several circles of teachers' professional lives. Additionally, in the context of evaluating teacher certification programs, assessing teachers' involvement in the school community, based on interactions with colleagues and leadership initiatives, is new; only few studies have investigated this aspect (Bastian et al., 2018; Edmondson et al., 2022) thus the model may contribute to both traditional and alternative programs.

Theoretical background

Herein we describe existing frameworks and models for evaluating TCPs, providing the grounding for the teacher-classroom-community model. We, therefore, focus on the affective aspects of teaching, elements of performance in the classroom, and interaction with the school community.

Evaluating teacher certification programs

There are several evaluation systems for TCPs in general and ACPs in particular. One example is the classroom assessment scoring system and the framework to support teaching (Marzano et al., 2011). It is aimed at assessing teachers' teaching skills, including teachers' and students' subject-matter knowledge, and teachers' ability to connect students' prior knowledge with new learning experiences, implement a variety of teaching and assessment methods, and manage student behavior and classroom procedures (Pianta et al., 2008). Other works focused on assessing teachers' efficacy, persistence, or student achievements (Canrinus et al., 2012). We concur with Bartell et al. (2019), who claimed that while these studies are valuable for assessing the quality of TCPs, they have several shortcomings (Bastian et al., 2018; Bartell et al., 2019), including: (a) their focus on events that occur in the classroom only, (b) relation to practices of the specific teaching

1 https://poh.education.gov.il/merhavminhali/hachsharahitmachutknisalehoraa/pages/specialprograms.aspx

profession they assess, and (c) they do not enable connecting the graduates' teaching quality with the characteristics of TCPs that need improvement.

In an effort to address these issues, we and others argue that when evaluating TCPs and ACPs, it is important to view the teacher as both a professional and a member of the school community (Bronfenbrenner, 1977; Bastian et al., 2018). Being part of a school community and contributing to it are essential for improving the quality of teaching (Ado, 2016). Furthermore, taking an essential part in the school community increases teachers' sense-of-confidence in the educational system and enables them to express their own opinions, thus increasing their motivation to remain in the teaching profession (Bartell et al., 2019). One model suggested by Bronfenbrenner (1977, 2009) is rooted in human development from childhood throughout adulthood and presents several circles including individual, microsystem, and macrosystem. Later, this model was adapted to educational systems (Basham et al., 2010; Shapira-Lishchinsky and Ben-Amram, 2017). To fully comprehend the features of the preparation program and understand how their graduates are integrated into the school system (Bastian et al., 2018; Warren, 2018), we must consider teachers' interactions in their work environment, not only the classrooms, but the whole school as a community.

The teacher-classroom-community model for evaluating alternative certification programs

In this study, we present a three-circle model (Figure 1) for assessing ACP graduates' integration into the school system. The inner circle represents the individual, the ACP graduate—the novice teacher. The next, classroom circle, refers to professional aspects of teaching as they play out in the classroom. The outer circle in our model addresses the teacher's interactions in the broader school community, such as peers and school management. The model accounts for challenges novice teachers (ACP graduates) encounter in both affective and professional aspects during their integration into the teaching profession.

The significance of our study and the model we propose stems from its holistic perspective of the teachers' involvement in the school, from the individual to the community level, such as, leadership and interaction with peers. Increasing literature documents novice teachers taking leadership positions. Research has examined the contribution of TCPs to the development of leadership skills and assessed the conditions required to facilitate formal and informal leadership (Ado, 2016; Cheng and Szeto, 2016; Meirink et al., 2020). Yet, we found little evidence on actions that develop teachers' leadership during their preparation programs.

Affective aspects of being a teacher

The teacher-classroom-community model accounts for traditional measures related to affective aspects of teaching, including self-efficacy, satisfaction for the profession, and attrition over time (Redman, 2015). Enhancing teachers' self-efficacy during their preparation program can increase their motivation to integrate into the school system and implement innovative teaching and assessment methods (Kahveci et al., 2018; Shwartz and Dori, 2020). Teachers' efficacy is associated with their beliefs about instruction and job satisfaction (De Neve et al., 2015), students' self-efficacy and motivation (Öqvist and Malmström, 2018), and students' achievements (Tschannen-Moran and Barr, 2004). It is important to develop teachers' self-efficacy because it is an essential tool for preparing effective, committed, and motivated teachers (Kahveci et al., 2018). Research has focused on teachers' attrition worldwide (Geiger and Pivovarova, 2018). Teachers were more likely to persist in teaching if they received solid pedagogical foundations, including observations of their lessons followed by feedback, and if they were engaged in practical and authentic experiences in the classroom with active teaching during their preparation (Unruh and Holt, 2010; Ingersoll et al., 2014).

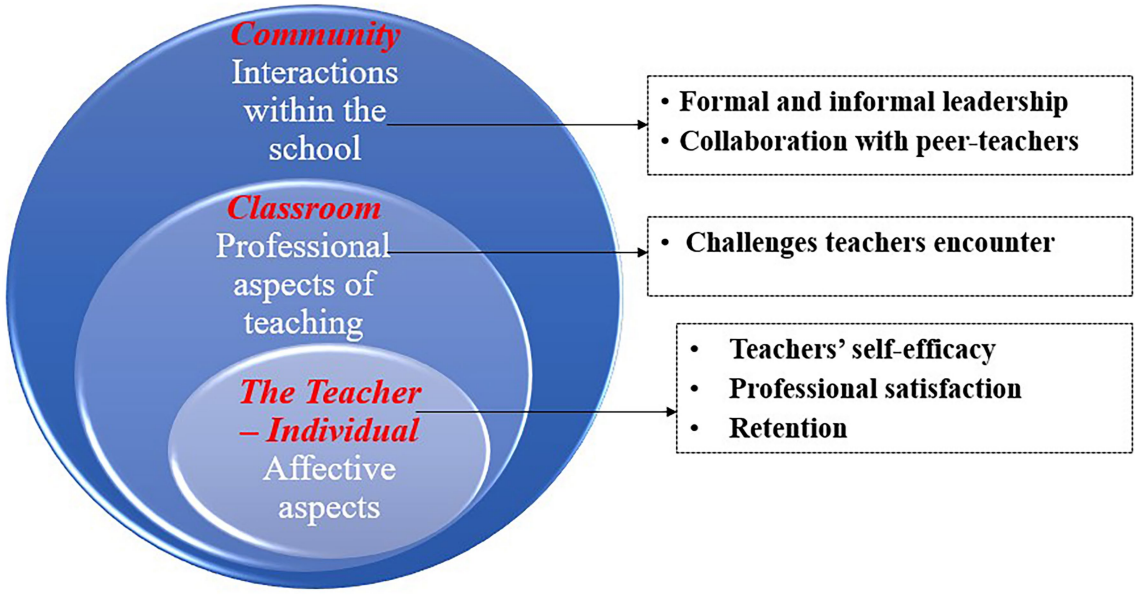

FIGURE 1
The teacher-classroom-community model for evaluating the effect of teacher certification programs on their graduates.

Performance in the classroom

Teachers' performance in the classroom involves content knowledge (CK), pedagogical knowledge (PK) with an emphasis on teaching strategies, pedagogical content knowledge (PCK), technological knowledge (TK) (Kramarski and Michalsky, 2015), knowledge about the curriculum, knowledge about school administration and classroom management. Wolff et al. (2021) proposed a definition for classroom management scripts based on expert vs. novice teachers' knowledge and how teachers react in response to events in the classroom. These scripts help clarify differences between how teachers handle the events based on their expertise. Their model makes visible the cognitive processes teachers exercise in classroom management, which can improve their awareness of overlooked factors in classroom management. They emphasize the centrality of sustained learning when managing a classroom. Saad and Bou Jaoude (2012) investigated the relationship between teachers' knowledge and beliefs about science and inquiry and their classroom practices. They found that teachers had diverse views of science and attitudes about inquiry, but they did not find links between teachers' views and classroom practices. Shwartz et al. (2021) have found that teachers' PCK and assessment knowledge (AK) vary with their classroom experience.

Leadership and teamwork: Interaction with the school community

Exhibiting leadership in the school community refers to any action that has a collective influence which benefits the students and the school and exceeds the classroom boundaries or the specific teaching discipline or connects the school with society (Fairman and Mackenzie, 2015). Leadership includes formal positions, such as administrative roles, professional disciplinary or interdisciplinary roles, mentoring and supporting other teachers, and management positions, all involving coordination of tasks and routines (Muijs et al., 2013). Informal leadership includes leading teams and evaluation processes, initiating innovative projects, such as extracurricular activities, design of learning-materials, and organizing projects (Muijs et al., 2013; Meirink et al., 2020).

Poekert et al. (2016) defined three areas of teacher leadership: individual, teams, and organizational. Previous research has shown that novice teachers are often highly motivated and passionate to contribute to improving education inside and outside the classroom (Levenson, 2014). A study of 16 schools participating in the "Teach First" program in England identified a consensus among ACP graduates and program directors that the teachers make a significant contribution to schools through informal initiatives and roles they take (Muijs et al., 2013). Both formal and informal teacher leadership improve schools in diverse ways and increase students' learning outcomes (Nappi, 2014). Teacher leadership contributes also to the school's commitment, personal empowerment of teachers, increased motivation, and reduced attrition (Muijs et al., 2013; Ado, 2016; Meirink et al., 2020). However, it is not always easy for novice teachers to enact their leadership in their first year of teaching. Their ambitions might collide with colleagues less open to changing their practices or accepting their ideas (Grimsæth et al., 2008) and who consider these leadership roles a distraction from the teaching itself.

Within our model, another aspect of the graduates' integration into the school community addresses teamwork and collaboration with colleagues. From a pedagogic standpoint, teamwork enables teachers to create a cohesive group in which they can exchange ideas, share teaching materials, brainstorm about best practices, and give feedback to one another about the lessons they teach. Teamwork allows teachers to create a community in which discourse that contributes to shaping their views as teachers is created (Nappi, 2014; Patton and Parker, 2017). This teamwork fosters teachers' professional growth and their sense of belonging to the school community, leading to the development of common values and teaching principles (Svanbjörnsdóttir et al., 2016; Wiyono, 2018). Teamwork may be influenced by the nature of the preparation programs attended by the teacher (Dori et al., 2019). Findings on the ability of ACP graduates to collaborate with colleagues are inconsistent and even contradictory. A study conducted in the United States found that ACP graduates found it difficult to communicate with their colleagues, resulting in professional isolation. Furthermore, they were not accepted by the school community as equal partners (Brown et al., 2004). Teachers also felt unsatisfied by inadequate opportunities to socialize with colleagues in the school community due to uncomfortable working conditions and strict school policies (Unruh and Holt, 2010; Redman, 2015).

We employed the teacher-classroom-community model to investigate the five ACPs and their graduates' integration into the teaching profession addressing the following dimensions: (a) self-efficacy, (b) challenges they encounter, (c) leadership roles, (d) teamwork, and (e) commitment to the teaching profession.

Methods

The study employed a mixed-methods approach which combines the advantages of qualitative and quantitative research methods (Creswell, 2014). To obtain different but complementary information on the same phenomena, the study was based on a Triangulation Design (Creswell, 2006), within which we implemented the Convergence Model, which uses quantitative and qualitative data, collected, and analyzed separately, toward the same research goal. During the interpretation stage, the various findings were combined and compared.

The qualitative data obtained from the interviews and the open-ended questions in the questionnaire contributed to understanding teachers' integration into the teaching profession from the affective, classroom, and school community perspectives. The quantitative data enabled us to compare the influence of the different programs on the graduates' sense-of-preparedness as teachers and generalize the findings to offer conclusions (Shekhar et al., 2018).

Settings and participants

We investigated the five major ACPs offered by institutions of higher education in Israel, including universities and colleges of education. These ACPs are conducted parallel to traditional teacher certification programs in the same institutions. The ACPs chosen represent diverse characteristics, targeted audience, and geographical locations. All the programs meet the basic standards defined by the Israeli Council for Higher Education and aim to attract high-quality candidates who will (a) become excellent teachers who implement outstanding teaching in their classrooms, (b) pursue leadership positions in their schools, and (c) lead changes in their school community. The programs differ in their screening processes, duration, curriculum, nature of preparation, and the guidance and support they provide their graduates later on in their careers. Following is a brief description of the programs, pseudonymed for anonymity.

- STEM-ed: A two-year, post-graduate, two-days-per-week program that strives to increase the quantity and quality of teachers in science and technology disciplines. Tuition is covered by the institute. Graduates receive an additional Bachelor or Master degree, based on prior degree and the coursework as well as high school STEM teaching certificate.
- PostDF: A one-year, post-graduate, two-days-per-week program designed for retired officers from the Israel Defense Force, that aims to prepare high-quality teachers for leadership positions in schools. Tuition is covered by the Ministry of Education pending 2 years of teaching. Graduates receive a high-school teaching certificate.
- STEM-clinic: A one-year, post-graduate, two-days-per-week clinical education program for second-career students with a STEM background. The program aims to prepare high-quality teachers in mathematics and science subjects. Tuition is covered by a philanthropic foundation; might require one year of teaching. Graduates receive a high school teaching certificate.
- SocLead: A social oriented educational leadership program consisting of a 5-week boarding school, introductory preparation followed by one-year of in-service preparation along with a day of courses per week. Tuition is covered by the Ministry of Education pending 2 years of teaching. Graduates receive a high-school teaching certificate.
- ExcelUnd: A merit-based, three-year, five-days-per-week program that strives to recruit undergraduate (honors) students with high abilities and prepare them to become leading teachers and outstanding educators. The program is an exclusive undergraduate program; tuition is covered by the institute conditional on a full year teaching. Graduates receive B.Ed degree. These students are characterized as highly motivated to the teaching profession and are high-level performing students and therefore they are comparable to their peers from the graduate ACPs. Furthermore, this program is defined by the Ministry of Education and the Council of Higher Education as an ACP.

To achieve a comprehensive picture of a teacher's integration into the school, participants represented different roles and positions in the ACP pipeline: teacher educators, novice teachers (graduates of the programs), other practitioners, such as mentors, and school principals.

The majority of the research population was ACP graduates who are novice teachers. We focused on ACP graduates with a teaching experience of 5 years or less because novice teachers can better reflect their experiences and the practices they acquired during their ACP, enabling us to link and evaluate the characteristics of each program and its impact on the teachers' integration.

The sample of graduates was obtained *via* the following procedure: An online digital questionnaire (described below) was distributed by the institution directors of the participating ACPs to ~3,000 graduates who had graduated during the 5 years prior to this study. A total of 506 graduates responded (17% response rate of). According to Fosnacht et al. (2017), this is a reliable rate if the sampling includes at least 500 participants. Since graduate's response was voluntary, the sample is not statistically representative. Table 1 provides background data of the ACP graduates that responded to the questionnaire.

Interviews were conducted with 30 of the participating graduates (novice teachers) who consented in the questionnaire to be interviewed. 41 additional interviews were conducted with ACP directors (14), principals (11), and mentors (17) in schools in which the novice teachers work. Figure 2 presents the participants by data collection instruments.

TABLE 1 Background data of ACP graduates.

Variable	Category	ACP
		N (% within program type)
Total		506
Gender	Female	311 (61.7%)
	Male	193 (38.2%)
Previous academic degree	Undergraduate	308 (60.9%)
	Master's	186 (36.8%)
	Doctorate	10 (2.0%)
Ethnic group	Jewish	462 (91.7%)
	Arab	30 (6.0%)
	Druse	4 (0.8%)
	Bedouin	3 (0.6%)
	Other	5 (1.0%)
Age (years)	19–24	77 (15.3%)
	25–29	139 (27.6%)
	30–39	147 (29.2%)
	40–49	79 (15.7%)
	≥50	61 (12.1%)
Teaching as a career	First career	260 (51.6%)
	Second career	196 (38.7%)
	Second career parallel to first	32 (6.3%)

Ethics statement

This study and research instruments were first approved by the ethical committee of the Institute, which serves as the review board for studies in behavioral research (approval number 2017-25). Additionally, since our research was conducted with teachers, we obtained approval from the Office of the Chief Scientist in the Israeli Ministry of Education (approval number 9545-2017). All participants gave their full consent. To ensure that all data remained confidential, we use pseudonyms, and any other identifying details were removed.

Research tools

The *Questionnaire* included close-and open-ended questions, congruent with our model as it addressed affective perspectives of being a teacher, practices implemented in the classroom, and teacher's integration into the school community.

The questionnaire comprised the following sections:

(a) *Demographic and personal data*: gender, age group (19–24, 25–29, 30–39, 40–49, 50+), ethnic group (Jewish, Arab, Druse, Bedouin, other), existing degree upon entering teaching studies (undergraduate, Master, Doctorate), discipline of instruction, institution of teaching

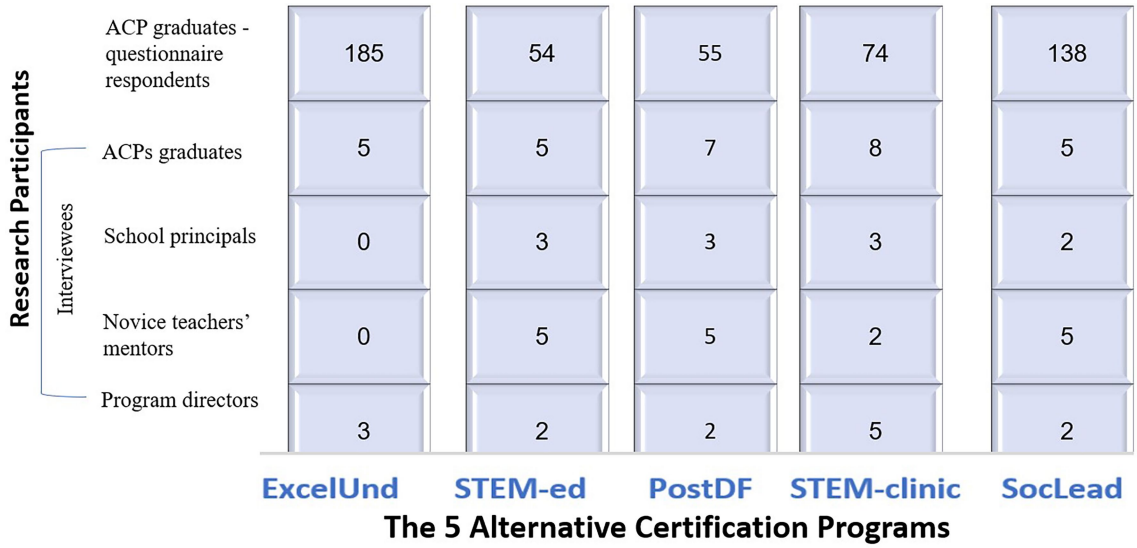

FIGURE 2
Research participants by tool, school role, and ACP.

studies, and status of teaching career relative to previous career (teaching as first/s career, teaching as second career parallel to another first career).

(b) *Program contribution to sense-of-preparedness in professional aspects of teaching* – This section, adapted from Feigin et al. (2015), included 10 items focusing on the extent to which the program contributed to them as teachers, based on a five-point Likert-type scale (1 = not at all to 5 = to a great extent). Example items: (1) The program provided me with basic teaching tools and skills, such as lesson planning, classroom management, and coping with learner diversity. (2) The program helped me understand the role of the teacher. This section had an internal reliability of $\alpha = 0.883$.

(c) *Self-efficacy as a teacher* – This section was based on the Teacher's Sense of Efficacy Scale (TSES) designed by Tschannen-Moran and Hoy (2001). Graduates were asked to rank the extent to which they agree with 12 statements relating to their teaching ability on a Likert-type scale, in three categories consistently identified by the TSES questionnaire: engaging students, instructional practices, and classroom management. Participants rated their extent of agreement (1 = disagree, 3 = agree to some extent, 5 = strongly agree) with statements concerning their abilities in these three categories. This section had an internal reliability of $\alpha = 0.881$.

(d) *Leadership and initiatives* – The participants ticked professional roles (homeroom teacher, subject coordinator, grade-level coordinator, social-involvement coordinator, school committee member, management roles, regional instructor, belong to the national principal's preparation program) they take on in addition to teaching.

(e) *Professional commitment and satisfaction* – To examine graduates' satisfaction with and commitment to the teaching profession, they were asked (1) whether they intended to teach in the following year, and (2) the likelihood of choosing teaching again given the opportunity to choose a career again. Both questions included a close-ended response with three options (yes, no, maybe).

(f) *Challenges encountered as novice teacher* – In this open-ended section, the graduates were asked to describe challenges they encountered in their integration into teaching and school life.

In the last part, we asked the respondents their willingness to be interviewed. From those who agreed, we chose a representative group of interviewees based on gender, age, former education, and instructional discipline.

Interviews

Semi structured interviews (a) examined how graduates perceive the quality of their ACP preparation, mapped the strengths and weaknesses of their ACP, as well as challenges they faced, and (b) assessed characteristics of the graduates' integration into the school system from a variety of perspectives of the other stakeholders. The interviews lasted about one hour, were audio-recorded and transcribed.

Data analysis

Qualitative data analysis

Interviews were thematically analyzed in several cycles. Coding began by breaking down the data into small segments that were later used to identify major themes and corresponding categories. Each statement focused on a single idea. Later, an in-depth discussion was held to corroborate the classification (Fraenkel et al., 2012). This process allowed for sensitive, insightful, and rich exploration of the text, exposing structure and underlying patterns (Guest et al., 2011). Open coding was performed by three experts, each one coded the interviews individually. The experts shared and revised their categories and discussed the possible interpretations of the data, reaching a consensus of 90%. This approach enabled mapping the implicit and explicit ideas within the text (Thomas, 2006).

Examples of the coding procedure are provided in Appendix A.

Frequency of challenges the graduates encountered (open ended section of questionnaire) – The frequency of each challenge out of the total number of challenges raised by the graduates in each program was calculated as follows. For example, if a total of 500 challenges were identified in program X, 10 of which related to overload in the teaching profession, the percentage of this challenge encountered in program X

was 2%. This enabled to both identify each program's characteristics and compare among the different programs.

Quantitative data analysis

Statistics were conducted with SPSS-20. For the closed-ended sections of the questionnaire (program contribution to sense-of-preparedness for professional aspects of teaching and self-efficacy) one-way ANOVA and Tukey's Test (*Post Hoc*) were conducted to examine the differences among the five ACPs regarding their graduates' perceptions of their program's contribution to the teaching profession.

Findings

The findings are organized in subsections according to the teacher-classroom-community model. We also present attributes of the ACPs that support the graduates' integration into the teaching profession.

The individual – affective aspects (the inner circle)

This subsection addresses teachers' self-efficacy and their satisfaction with and commitment to the teaching profession as they integrate into the school system during their first 5 years of service.

Self-efficacy scores for all the ACP graduates were high (mean score range 3.99–4.28; SD 0.50–0.62), indicating the participants' strong sense of efficacy to implement diverse instructional strategies, engage their students and manage their classrooms. Interviews with mentors corroborated these findings. One SocLead mentor noted: "*Watching the ACP graduate in the classroom, her teaching exhibits variety of methods, inclusiveness of all the students in the class, and creativity. However, from the class management perspective, there is chaos. When I asked the teacher about the noise in the classroom, she responded that this is 'learning noise'. I interpret this as SocLead teachers' high motivation and the desire to be considered 'cool' by their students.*" A mentor of an ExcelUnd novice teacher reported: "*He is not content with mediocracy; he puts a high bar for himself and thrives to get there…this requires talent, motivation, and self-efficacy, as well as knowing where and how high the bar should be set.*" This and other quotes support the quantitative finding of high ACP graduates' self-efficacy.

A significant difference was found only between PostDF graduates, who reported the highest self-efficacy (which can be attributed to their previous leadership positions as military officers) and graduates of the STEM-clinic clinical program for second career students with STEM backgrounds, who reported the lowest self-efficacy (*Post Hoc* $F = 2.79$, $p < 0.026$).

Professional satisfaction and commitment

Figure 3 presents the likelihood of "choosing teaching again." In all but one ACP, over 55% of the graduates responded that, given the opportunity, they would choose the teaching profession again, and only a minority responded negatively. This may reflect the fact that most of these programs are directed to second-career students – individuals with a specific interest in making the change from their previous career to the teaching profession. This is also expressed in their explanations which reflect a sense-of-mission in their new profession. For example, a STEM-ed graduate wrote: *As a teacher, I feel that this profession inspires me, and I enjoy the diversity and the deep meaning this profession embodies.*

Graduates of three programs, Excel-Und, STEM-ed, and STEM-clinic, were hesitant, ticking the "maybe" option about choosing a teaching career again. Workload and unfavorable employment conditions in the teaching profession, primarily salary, were common reasons for their hesitance. Also, graduates did not anticipate the amount of work and responsibility they would have as full-time teachers. One graduate emphasized: *I work a lot of hours and I feel like it never ends; students, teachers, parents, e-mails, grading tests,* etc. An ExcelUnd graduate wrote: "*I am expected to be available all the time, but they would not pay me for that time… devoting myself to teaching is one thing but living in constant stress is not a legitimate expectation.*"

Graduates of the STEM-oriented programs (STEM-clinic and STEM-ed) expressed criticism of the school's fixation and limited flexibility toward innovative projects and new approaches, emphasizing their disappointment in their school colleagues' and administration's attitudes towards their motivation to implement a variety of teaching methods. One STEM-clinic graduate said: "*During my first year at school, I seriously considered leaving the teaching profession because I felt that the school system did not know how to use my abilities properly.*"

Regarding commitment to the teaching profession, explored *via* the participants' intention to teach in the following year, the majority (64–75%) of ACP graduates responded positively.

Classroom – Professional aspects of teaching and challenges teachers encountered (middle circle)

The graduates described a variety of challenges and difficulties they faced in the classroom as novice teachers despite their reported high sense of self-efficacy. They addressed various challenges related to content knowledge (CK) and pedagogical knowledge (PK), including instructional strategies and classroom management, as well as pedagogical content knowledge (PCK), technological knowledge (TK)—incorporating technology into teaching, knowledge about school administration, and knowledge of the curriculum. Figure 4 shows the percentage range of challenges from the total number of challenges participants mentioned, by knowledge types. Classroom-management-related PK poses the highest percentage of challenges (23–46%) that graduates of all ACPs experienced, followed by instructional-strategies-related PK (1–10%).

Knowledge about school administration also posed a challenge, especially among SocLead and PostDF graduates, who expressed difficulties in understanding how to navigate within the educational system in general and in the school environment in particular. One graduate expressed this feeling during his interview: "*I had difficulty from an administrative point of view; What was required from me? To whom should I report if a lesson is canceled? Who can help me organize and schedule field trips? All kinds of administrative aspects that I did not know, and I had to learn on my own.*"

Insufficient CK (taught as part of the program) was mentioned mainly by SocLead graduates, who stated that this aspect of their program should be better addressed in the program. While praising the novice teachers' functioning in the classroom, mentors also pointed out challenges they identified in their integration into teaching. As observed by one mentor of graduates of this program, "*She defines this as an experimental period to check out if it suits her. She has acclimation difficulties that characterize new teachers. I hope she can withstand them, as the first year in teaching is a hard year, and [the novice teacher's name] entered as a substitute teacher, replacing a teacher on maternity leave, which, in itself, is difficult.*"

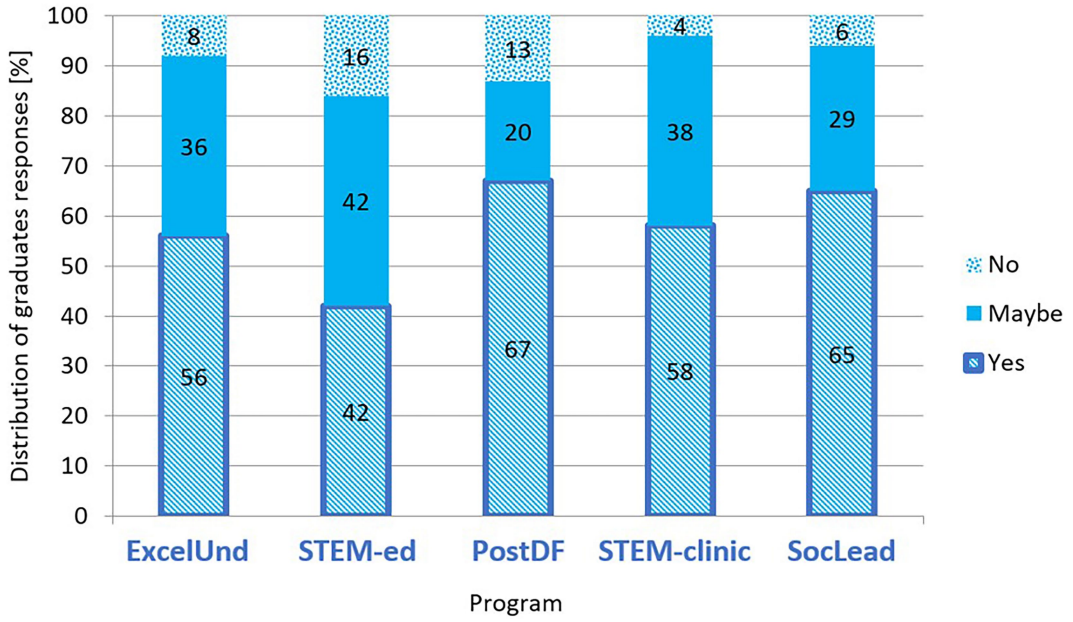

FIGURE 3
Distribution of ACP graduates' responses regarding re-choosing the teaching profession (N=506).

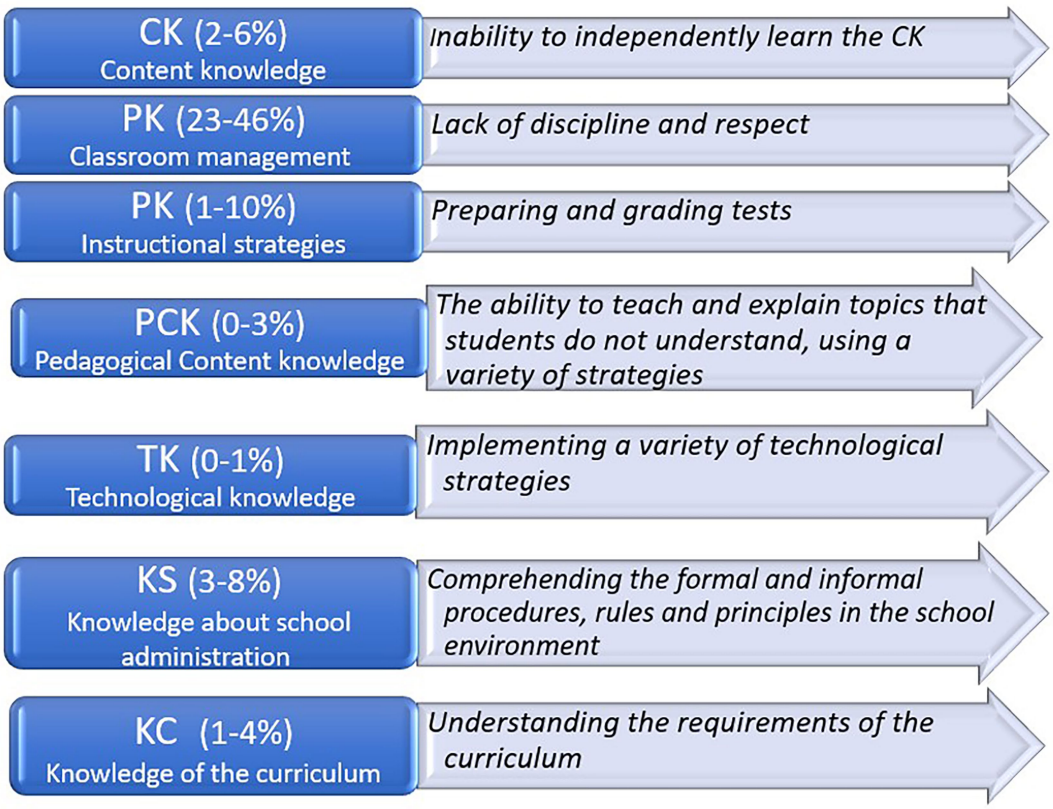

FIGURE 4
The reported percentage of challenges by knowledge types out of all the challenges.

Conversely, STEM-ed graduates were confident in their CK but less so in class management. Indeed, a STEM-ed mentor said: "*their CK is excellent, and they know to enrich their students' knowledge and foster their curiosity and interest in science…however, when it comes students' behavioral problems, many of these STEM-ED teachers have hard time coping with them. This causes novice*

teachers' frustration, as the school management is not always helpful in this regard."

Interactions within the school community (outer circle)

Teachers' integration into the school community was assessed from three aspects: taking on roles additional to teaching, leadership, and teamwork.

Roles

Data analysis revealed that despite being novice teachers, many ACP graduates took responsibility on various roles in the school community in addition to teaching their subject. Table 2 shows the percentage of graduates in different positions in the school.

The most common role was, expectedly, homeroom teacher (64%), followed by subject coordinators (29%) and 13.3% members of a school committee (13.3%). In Israel, all grade levels have homeroom teachers, and in middle-and high school they serve as liaisons between the student, other teachers, and the parents. Some graduates undertake more than one role (explaining why the total percentage is >100%). PostDF is the program in which graduates undertook the highest number of roles, likely reflecting their previous experience as retired military officers in leadership positions.

These graduates took large-scale roles, such as head of a grade-level student cohort, which is not typical of a novice teacher, as evident in graduates of the other programs. A principal of a school with several PostDF graduates shared the following: "*They come mature, and very quickly they find themselves moving into roles that require a lot of responsibility and discipline. Two of my PostDF teachers are responsible for coordinating 300 students. Their experience in military positions enables them to cope with pressure and time management issues.*"

SocLead graduates also undertook several roles within the school community, which is consistent with the high sense of mission emphasized by graduates of this social-educational leadership program and their aspirations to change the school system. One graduate shared: "*What did we learn in our preparation program? I think that something about the 'state of mind' – that you are becoming an agent of change, and that you are part of a group that shares this purpose.*"

Supporting evidence for the career aspirations of SocLead graduates comes also from mentors of this program: "*They have great, focused goals…they really want to move forward and become professionals.*" One mentor even criticized this tendency and described graduates who were oriented toward overachieving this goal and skipping the necessary steppingstones of being novice teachers. Consistent with this, SocLead graduates reported difficulties with time management, possibly explained by the large number of positions they hold in school in addition to being full-time teachers. One of the school principals who was interviewed about SocLead graduates in her school claimed: "*I expect SocLead graduates to contribute to the school community in any possible way, including taking upon themselves different roles.*"

In the subject-oriented STEM programs, STEM-ed and STEM-clinic, we saw substantial contribution to the professional aspects of teaching, such as serving as a subject coordinator of a specific STEM discipline (STEM-ed), taking responsibility for assessment methods in the school, or being an educational technologies advisor (STEM-clinic).

Noteworthy, the views regarding taking on additional responsibilities to teaching as novice teachers were inconsistent. Several graduates and mentors voiced that a novice teacher should not fulfill additional roles but rather focus on teaching one's subject. As stated by one graduate, "*I consciously chose not to take on roles in the school in my first year. My feeling is that my educational activity is not at the organizational political level, but at the level of the child and what happens in the classroom, and I decided to dedicate my time to this.*" This approach was also voiced by a mentor of the SocLead program, (Teach First) who critiqued the program for requiring, in her opinion, over-involvement of the novice teachers that can lead to excess pressure and a sense of failure: "*The message this program puts forth is dangerous…their first year is not one in which they should be overloaded. Each SocLead graduate that comes in, they load on him a million and one things. This is not right. If I want this teacher to persist in the school as a teacher, which is beneficial to us all, I need to protect him from all the excess things requested of him. In the end, he burns out and experiences failure.*" A principal voiced the opposite: "*There are those who claim the need for acclimation, only their subject, after that homeroom teacher – not from the beginning. I think the exact opposite. If they have the dream to be a coordinator, let them start right away.*"

TABLE 2 Distribution of graduates in different formal positions in the school (Sum of categories is not 100% since an ACP graduate may select more than one role).

Program Role (%)	ExcelUnd (*N*=84)	STEM-ed (*N*=24)	PostDF (*N*=37)	STEM-clinic (*N*=27)	SocLead (*N*=106)
Homeroom teacher	81	25	67	52	68
Subject coordinator	27	54	30	22	21
Responsible for assessment methods in the school or for technology applications	8	25	30	30	17
School committee member	12	4	13	7	16
Grade-level	2	0	19	0	8.5
Social involvement coordinator	5	0	3	0	7
Management roles	1	0	3	4	2
Total percentage	136	108	165	115	139.5

Leadership

An element indicative of graduates' leadership and integration into the school community is their initiation and promotion of projects and initiatives. The graduates were asked about the opportunities they had to lead such initiatives and described several of those in more detail. In four programs, 63–77% of the graduates promoted initiatives in their school community. Only in the STEM-clinic program, less than half reported on their initiatives in school. The initiatives were diverse and included leading the organization of ceremonies and school events in, incorporating educational technology, establishing a school website, implementing leadership projects, such as editing the school newspaper, conducting educational field trips, and conducting community projects, such as volunteering.

While the graduates did not describe leadership as a challenge in itself, they identified various difficulties: (1) lack of confidence to initiate as novice teachers: "*In the beginning, you need inner courage to share your ideas. If you do not have a sense of belonging to the school, you do not know if anyone will listen to you. Therefore, you do not always have the motivation to initiate projects.*" (2) time management issues: "*This year I am a homeroom teacher, and I do not really have the time to contribute outside my classroom.*" (3) lack of support from colleagues and the administrative staff in school: "*In theory, there are opportunities to initiate, but in practice, there is no support or assistance from the management.*"

Teamwork

Successful integration into the school community is dependent, among other things, on novice teachers' ability to collaborate with colleagues and feel comfortable to turn to them for assistance or advice. All the respondents identified this aspect significant. A higher percentage of the Excel-Und, STEM-ed, and STEM-clinic graduates reported this as a challenge (8–9%), while fewer SocLead (Teach First) and PostDF (the retired military officers) graduates did so (4–5%). For example, a STEM-ed graduate said: "*From the social perspective, I find it difficult to position myself among my colleagues. I have a certain perspective that does not match theirs. I sometimes feel isolated not knowing who I can ask for help, so the process of connecting with colleagues on the personal and professional level is slower for me.*"

Principals expressed the following perspectives regarding the ability of second career teachers to cooperate with their colleagues: (1) Greater potential of ACP graduates to apply teamwork due to their first-career experience and ability to lead and work in teams: "*These graduates have extraordinary communication skills and experience in leading teams and projects.*" (2) Difficulties of ACP graduates to apply teamwork due to ego issues: "*Those who come from hi-tech have some ego issues because of their knowledge and experience, it gets in the way of listening to other perspectives and working in teams.*"

Difficulties reported by SocLead graduates in working with their colleagues were related to their sense of posing a threat to the experienced teachers, who were not interested in the changes and the projects they offered. Some graduates emphasized that the ability to connect and work with colleagues is dependent on the organizational culture inside the school. As shared by one graduate who switched schools after her first year of teaching: "*In the second school I taught, I felt much better with the teachers because the school atmosphere was different. They were more open to other perspectives and ideas, and this was the foundation for my interaction and communication with colleagues.*"

Alternative certification programs characteristics that support graduates' integration into the teaching profession

The aspect the graduate interviewees perceived most significant in contributing to their teaching is PK. This finding is particularly prominent in the STEM programs (STEM-ed and STEM-clinic) and PostDF, the program for retired military officers. For graduates of these programs, different types of teachers' knowledge (CK, PK, and PCK) and TK were central to their teaching.

Professional identity was most important to SocLead graduates. Enhancing teachers' leadership skills was also identified by these graduates, reinforcing our findings regarding their leadership roles in their schools. The interviewees emphasized the importance of developing leadership skills during the preparation program to their teaching practices. Graduates of PostDF indicated low contribution of the program to developing their leadership skills, most likely due to their previous military leadership experience. Excel-Und graduates displayed a more balanced contribution of the different components to their teaching. This may be explained by the fact that this is an undergraduate program, thus its students are less experienced than the second career students of the other programs.

Contribution of the programs to the graduates' sense-of-preparedness in specific professional aspects of teaching was explored in the close-ended section. Table 3 compares the contribution to specific components of the graduates' sense-of-preparedness among the different programs.

Each ACP exhibits a different set of strengths. SocLead scored highest for its contribution to CK, professional identity, and teamwork. In line with this, enhancing teamwork skills during the program helped graduates integrate successfully into the school community as one mentor commented: "*SocLead novice teachers arrive at school with a belief that they can change the world, and this belief is clearly reflected in their leadership…*" The STEM-oriented STEM-ed program contributed most to the graduates' PCK and TK.

Figure 5 links the programs' characteristics to graduates' citations regarding affective aspects, classroom performance, and their interactions with the school system community. Our model enables presenting the contributions of ACPs in all three aspects: the individual teacher—self-efficacy and professional commitment, the classroom—acquired knowledge and challenges teachers face, and the school community—teamwork. Developing teacher's knowledge types was significant for the graduates' self-efficacy and classroom performance. Leadership skills developed during the program contributed to all the three circles of the novice teachers' experience in the schools.

Discussion

Concerns regarding the role of evaluation and assessment in teacher education are shared by policymakers, researchers, and teacher educators (Richmond et al., 2019; Edmondson et al., 2022). Given the significant variation among different ACPs in Israel and the students they admit, this study presents a teacher-classroom-community model that is inclusive with respect to the various ACPs and enables novice teachers to express their experiences and may, thus, guide ACP directors in improving their programs. The

TABLE 3 Comparison of the contribution of various ACP characteristics to the graduates' sense of preparedness in professional aspects of teaching among the ACPs.

ACP attribute	Highest score	Lowest score	*F*	*p*	*Post Hoc* (significance among groups)
CK	SocLead 4.50 ± 0.56	PostDF 3.04 ± 1.40	7.133	0.000	SocLead > ExcelUnd
					SocLead > STEM-clinic
PK	SocLead 3.50 ± 1.01	PostDF 3.34 ± 0.92	0.409	n.s.	-
PCK	STEM-ed 3.62 ± 1.01	PostDF 2.75 ± 1.18	6.613	0.000	STEM-ed > ExcelUnd
					STEM-ed > PostDF
					STEM-ed > SocLead
					STEM-clinic > PostDF
					STEM-clinic > SocLead
TK	STEM-ed 3.78 ± 0.95	PostDF 2.84 ± 1.17	3.773	0.002	STEM-ed > PostDF
					ExcelUnd > PostDF
					STEM-clinic > PostDF
Professional identity	SocLead 3.81 ± 1.07	STEM-ed 3.06 ± 1.08	5.113	0.000	SocLead > STEM-ed
					ExcelUnd > STEM-ed
Teamwork	SocLead 3.63 ± 1.24	PostDF 3.00 ± 1.20	3.539	0.004	SocLead > PostDF
					SocLead > STEM-clinic
Leadership	ExcelUnd 3.36 ± 1.23	STEM-ed 2.60 ± 1.13	7.347	0.000	ExcelUnd > STEM-ed = PostDF
					ExcelUnd > STEM-clinic
					SocLead >STEM-ed
					SocLead > STEM-clinic
					SocLead > PostDF

comprehensiveness of our model has enabled to present an accurate depiction of the various ACPs, differences among them, and ways in which these programs can improve the integration of their graduates into the school system.

The study investigated the five leading national programs. Despite the diversity of the target audience and the characteristics of the different programs, our proposed model enabled us to elicit a common language for the leaders of teacher education programs.

Developing a common language across teacher certification programs

Comparing data across the five ACPs indicates that these programs have prepared novice teachers with different knowledge, skills, beliefs, and classroom experiences for their profession. For example, graduates of the STEM-oriented programs (STEM-ed and STEM-clinic) perceive types of knowledge – (CK, PK, and PCK) as the program components that were most significant in their contributing to them, while graduates of more socially-oriented programs (SocLead and ExcelUnd) described leadership skills as the most beneficial. These differences are also reflected in how graduates of these programs integrated into the school community: STEM-oriented (STEM-ed and STEM-clinic) graduates took on fewer roles, and these focus on more discipline-related roles, while among SocLead, PostDF, and ExcelUnd graduates, being homeroom teachers and heads of age cohorts was more common. This variation reflects - certain programs' focus on the development of the interpersonal domain, which involves teamwork, collaboration, and leadership skills while others emphasize building teachers' knowledge and expertise as subject-matter specialists from the CK and PCK aspects, similar to that reported in other studies (Rosenberg and Sindelar, 2005; Redding and Smith, 2009). These findings indicate different teacher preparation approaches: it may be argued that offering a variety of programs, each with its specific focal areas, has merits to the educational system given the wide variety of integration-attributes and the increasing professional requirements of schoolteachers. However, ACPs would benefit as well by creating a common language that shares their goals and beliefs about what teachers should know and be able to do after graduating from the program (Tatto et al., 2016). Such teachers' knowledge facilitates their development as excellent and motivated professionals who advance student learning and are committed to the school community.

Teacher-classroom-community model – connecting alternative certification programs characteristics to its graduates' integration into the school system

Figure 6 situates the major program characteristics graduates identified as supporting their integration into teaching within the circles of the model.

Data collected through our research tools and guided by our framework enabled connecting the contribution of each ACP to the integration of its graduates into the teaching profession. Self-efficacy was rated high (4.0–4.3) as was CK (3.0–4.5), while pedagogical knowledge scored lower: PK < 3.5 is conservatively intermediate, and PCK scored in the range 2.8–3.6 with the highest variance, indicating large differences

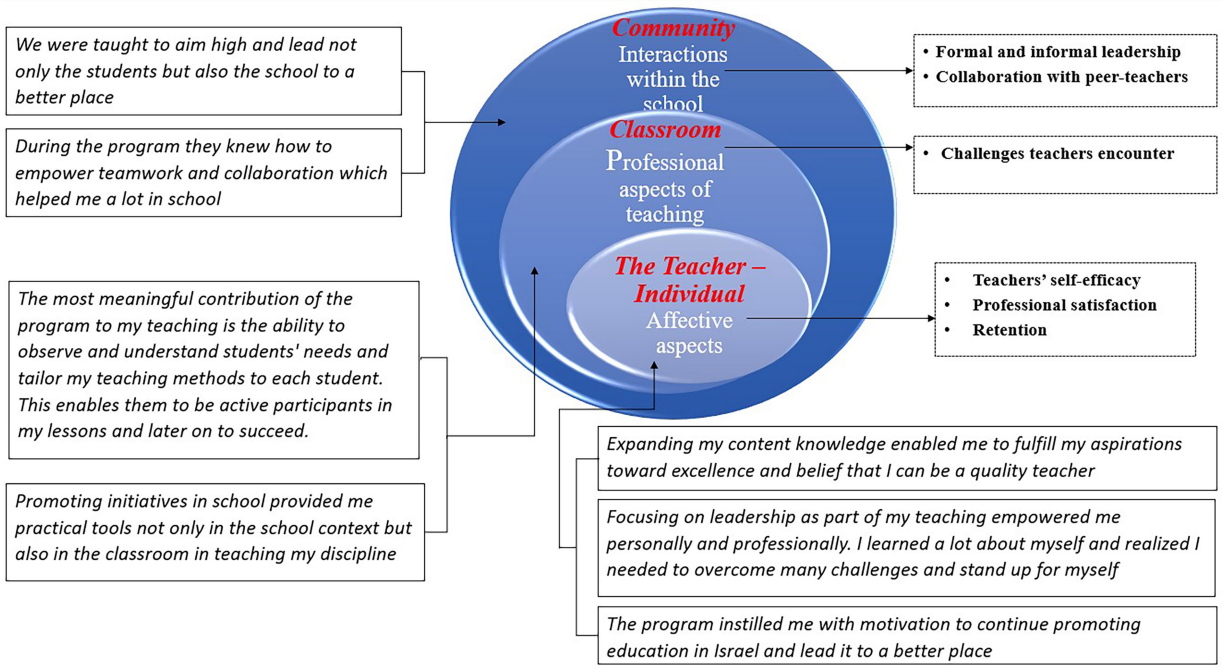

FIGURE 5
Graduates' citations regarding the three circles of our model.

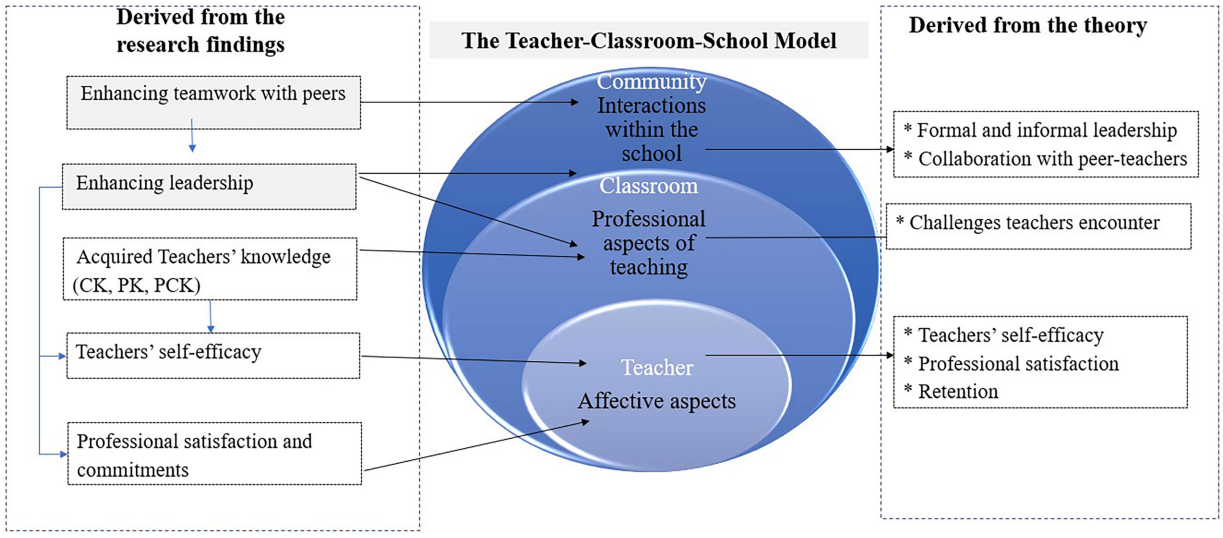

FIGURE 6
ACP characteristics that support graduates' integration into schools and their links to the circles of the model.

between the ACPs in this component. Teamwork ranked intermediate (3.0–3.6), and leadership scored lowest (2.6–3.4). Overall, these findings indicate a gap between the graduates' high self-efficacy, which can be attributed to their high internal motivation, and other components related to the outer circles of the model, which the participants perceived as having medium to conservative contribution. Another influential characteristic was the teachers' level of three knowledge types—CK, PK, and PCK. These improve teachers' classroom performance, self-efficacy, and professional satisfaction. Teachers are empowered in their school assimilation by high levels of these characteristics.

Integrating the findings within the model reveals that promoting and enhancing leadership skills within the program has a 'systemic effect' as it positively impacts most if not all integration aspects. Thus, specifically focusing on teacher leadership (elaborated in the following) should become a central element in all ACPs.

Leadership

Teacher leaders, as described in the literature, are uniquely positioned to promote change within schools; they have the potential to lead the school community by increasing teacher collaboration,

implementing best practices, encouraging teachers' professional development, offering assistance to colleagues or novice teachers, and focusing on content-specific issues (Leithwood et al., 2008). In this study, more than half of the ACP graduates, despite having less than 5 years of experience, reported taking on various positions and leading various projects in the school community, and some reported taking on more than one role. This was more prevalent among SocLead and ExcelUnd graduates, who attributed their propensity for leadership to their preparation program. As seen in Figure 6, graduates emphasized that enhancing their leadership skills contributed not only to their integration into the school community, but also to their classroom practices and to affective aspects, such as self-efficacy, satisfaction with and commitment to teaching. In view of this, we claim that assessing the quality of teachers' leadership is essential for evaluating teacher certification programs—ACPs as well as TCPs. These programs must explicitly consider how to prepare teachers in ways that allow them to develop leadership skills and implement them in the school context, with the aim of increasing their sense-of-belonging and aspiration for further professional development (Watt and Richardson, 2008; Ado, 2016). Many studies show the positive influence of teachers' leadership and initiatives on students' achievements, as well as on teachers' sense of self-efficacy and professional identity (Muijs et al., 2013; Ado, 2016). Concomitantly, it is important to emphasize that various challenges, such as lack of support from colleagues, time management, and low self-confidence, came up as obstacles that prevent novice teachers from demonstrating leadership qualities. Therefore, teacher certification programs should provide a foundation for teachers to understand the realities of the school context they will enter and cultivate competencies for taking initiative within this context (Honawar, 2007).

Teamwork

Regarding teamwork with colleagues, teachers create a professional community with their colleagues by taking an active part in reflective dialogs, engaging in discussions about teaching and assessment methods, collaborating, consulting, and receiving feedback about their teaching. Teamwork contributes to teachers' professional growth and sense of belonging to the school community, leading to the development of common values and teaching principles (Svanbjörnsdóttir et al., 2016; Wiyono, 2018). Furthermore, becoming a more effective teacher by engaging with colleagues increases the likelihood of persisting in the profession (Bartell et al., 2019). In this study, graduates of all programs noted that teamwork was a challenge for them. Some of the graduates attributed this challenge specifically to the ACP, and criticized the prestige associated with ACPs graduates or with their prior careers in industry or the army that in their opinion, seems to pose a threat to their colleagues. This finding corresponds to other studies in which ACP graduates reported experiencing difficulties collaborating with colleagues, often finding themselves in professional isolation (Brown et al., 2004). Other graduates mentioned that successful teamwork became possible thanks to the teamwork skills they acquired in their preparation program, or their school organizational culture that is supportive of novice teachers' integration and ideas. This finding shed light on the importance of not only experiencing and implementing teamwork during teacher certification programs, but also to explicitly paying attention to: (a) how to actively develop professional relationships with peer-teachers, and (b) how to access this relationship in the context of the school environment. Addressing these aspects not only enhances teacher's collaboration with colleagues but also lays the foundations for becoming leader teachers (Burke et al., 2015). Given the increased expectation for teamwork in schools and its wide-ranging contribution to various professional aspects of teaching and integration, our findings suggest that ACPs should consider connecting teamwork to understanding what leadership entails. Stated otherwise, teamwork should be regarded in ACPs as a dimension of teacher leadership. Facilitating collaborations among teachers, creating communities of teachers who jointly engage in various aspects of professional development is a central attribute of teacher leadership (Fairman and Mackenzie, 2015).

Teacher's self-efficacy and commitment to the teaching profession

Enhancing teachers' sense of self-efficacy during their preparation program can increase their motivation to integrate into the school system and implement innovative teaching and assessment methods (Kahveci et al., 2018). Concerning self-efficacy, the findings of this study present a complex picture. ACP graduates reported having high self-efficacy, but at the same time they described several challenges they experienced, mainly related to classroom management and pedagogical knowledge. This result highlights the importance of evaluating teacher's affective aspects of the teaching profession, alongside professional (classroom) aspects, as conducted in our framework.

Challenges faced by novice teachers are well-documented in the literature (Chaaban and Du, 2017; Wolff et al., 2017), and teacher certification programs can help pre-service teachers cope with these challenges by practicing teaching scenarios in a 'real-life' authentic setting (Gray and Taie, 2015; Dori et al., 2019). However, the short duration of these programs and resulting fewer opportunities to be in the classroom, could be a disadvantage of ACPs.

The graduates emphasized the importance of acquiring teacher's knowledge for their sense of self-efficacy (see Figure 6). According to the graduates, acquiring the relevant knowledge instilled confidence in them and provided an opportunity to integrate a variety of teaching methods into their lessons. Incorporating these aspects into the preparation programs provides the foundations for teachers' successful integration into the teaching profession (Lee and Lamport, 2011).

Extensive literature has addressed the issue of low retention and high teacher attrition among novice teachers (e.g., Rosenberg and Sindelar, 2005; Redman, 2015; Zavelevsky and Shapira Lishchinsky, 2020). The characteristics of teacher preparation program acknowledged by graduates, such as the pedagogical tools they receive and their acquired knowledge, are main factors influencing teachers' commitment to the teaching profession (Gray and Taie, 2015). In this study, over 60% of the graduates of all programs indicated that they intend to continue in the teaching profession. Those who were not sure, attributed their uncertainty to various frustrations in navigating the school and the educational system. These challenges should be addressed in teacher certification programs by providing teachers with strategies for navigating the school context during the integration process. Speaking directly and openly about the challenges the educational system may pose, while building a foundation for leader teachers, may increase the level of teachers' commitment and dedication to the profession and resilience to withstand challenges (Unruh and Holt, 2010; Redman, 2015).

The need for alternative certification programs parallel to traditional teacher preparation programs

The acute shortage of teachers in general, and STEM teachers in particular, mandates that society capitalizes on its human resources of qualified and experienced people as teachers. The scarcity of STEM teachers is so significant that no program should be discontinued; conversely, the ACPs should recruit more students and maintain open channels to openly discuss strengths and challenges each ACP experiences, so these programs can continuously improve through self-and peer assessment. ACPs must be nurtured so they continue to thrive alongside and in addition to the traditional four-year programs, ideally cross-fertilizing each other with new ideas.

Each ACP has its unique characteristics, audience, and contribution. The teacher-classroom-community model has enabled us to identify the uniqueness, strengths, and shortcomings of each ACP. Employing this model may provide insights for ongoing reflection and improvement of teacher preparation programs toward alleviating the widespread issue of shortage of teachers.

Limitations, strengths, and further research

Tools for assessing teacher preparation programs include observations, analysis of teachers' artifacts, such as designed assignments, and self-reports (Goe et al., 2008). One limitation is that our research is based mainly on self-reporting by the participants, and their perception of their preparedness. This may not reflect their actual practices or their successful transition into the teaching profession. Despite this, the model employed in this study and the factors investigated in each of its circles, offer a rich and holistic depiction of the novice teachers' experience in school life, which, in turn enables to obtain information regarding the characteristics of teacher's preparation programs, and evaluate their impact on preparing teachers, including focus on classroom experiences from the teacher's point of view. Sharing the challenges identified in this study with the ACP directors can aid teacher educators address them during the program and transform them into learning opportunities that will later shape the graduates' beliefs and professional identities (Pillen et al., 2013).

The strength of this study lies in several aspects of its methodology: (a) its application of the comprehensive teacher-classroom-community model for evaluating teacher certification programs in several contexts and with diverse groups of participants. The model may contribute toward a systematic analysis of novice teachers' immersion in schools. (b) The research tool we adapted and modified—the holistic questionnaire for assessing the characteristics of ACPs and teachers' efficacy for successful integration. The advantage of this questionnaire over observational tools is that it is less demanding in terms of time and resources. Together, these enabled to highlight important aspects that teacher education leaders should consider and use for self-evaluation of their programs.

A methodological limitation pertains to its participants. Despite the high number of participants, the graduates' response to the questionnaire and participation in the interview was voluntary. This may lead to self-selection bias.

We recommend applying this model on a diverse population of ACP graduates in other countries. Further research is also needed to find ways of using similar data and encourage program directors to collaborate toward program improvement (Bartell et al., 2019). Future studies that apply our teacher-classroom-community model may include (1) comparative analysis of ACPs and traditional programs, (2) investigating the motivation and demographic variables of the entering ACP attendees as they relate to the three circles of our model, (3) longitudinal studies that examine different points in time along the preparation and integration of graduates into the teaching profession.

Data availability statement

The datasets presented in this article are not readily available because we are not allowed to share the raw data. Requests to access the datasets should be directed to yjdori@technion.ac.il.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics committee of the Chief Scientist, Ministry of Education, approval # 9545. Behavioral Sciences Research Ethics Committee at the Technion. The participants provided their written informed consent to participate in this study.

Author contributions

YJD led the research, the design of the model, the qualitative data analysis, and the paper authoring. DG led the quantitative data analysis and was one of the leading authors of the paper. GS led the data collection, participated in both the quantitative and qualitative data analyses, designed the graphics, and wrote the first drafts of the paper as part of her PhD. NL-A participated in the data collection and qualitative analysis. AS participated in the data collection and quantitative analysis. TT participated in the data analyses and contributed to authoring the paper. All authors contributed to the article and approved the submitted version.

Funding

This study was partially funded by the Israeli Ministry of Education, Chief Scientist Office (Grant number 3-13749).

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Appendix A

We present a few examples of the way we classified responses into category and sub-category:

1. "*Teaching the basics of chemistry and enriching the content knowledge beyond the curriculum enabled me to feel comfortable in the classroom. I particularly remember solving in 'real time' the matriculation exam that high school students complete during their chemistry studies, and it helped me a lot to be in the position of the students and understand what is required from them* [**Category: Teachers' acquired knowledge; Sub-category: Content knowledge**]. *Yet, I understand I did not spend enough time in the classroom to comprehend everything that comes with it. I would like more practical experience in the classroom and less 'pretend play' … for example, actually teaching a laboratory class to high school students … as a teacher, it was difficult for me to cope with 20 students in one laboratory* [**Category: Program methods; Sub-category: Practicing teaching in real-life context**]" [ICA].
2. *"… I am used to working in teams from my previous job, but I felt that it was different, because I felt comfortable sharing my point of view and listening to others' views and approaches to teaching… It was an open space for me to express myself"* [**Category: Program methods; Sub-category: encouraging teamwork**].
3. *"…It was a mission to influence the next generation and contribute to adolescents from my own knowledge and experiences."* [**Category: Program outcomes; Sub-category: professional identity**].