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Bengmark, S., Fainsilber, L., Gustafsson, T. (2024). What graduates want in teacher education. Scandinavian Journal of Educational Research, In press.
<http://dx.doi.org/10.1080/00313831.2024.2318651>

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To cite this article: Samuel Bengmark, Laura Fainsilber & Tommy Gustafsson (21 Feb 2024):
What graduates want in teacher education, Scandinavian Journal of Educational Research, DOI:
[10.1080/00313831.2024.2318651](https://doi.org/10.1080/00313831.2024.2318651)

To link to this article: <https://doi.org/10.1080/00313831.2024.2318651>



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Published online: 21 Feb 2024.



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What graduates want in teacher education

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ABSTRACT

To understand what to improve in initial teacher education to better prepare teachers for their profession, we asked alumni ($N = 93$) from three Swedish initial teacher education programs, what in their education they thought had benefited them the most in preparing them for a teaching career, and what they thought was lacking given their professional needs. Questionnaire responses yielded seven categories: *leadership, practicum, didactics, teaching methods, assessment, and personal development*. Our results show that the practicum is seen as very valuable and that alumni wish they had been taught more about leadership in the classroom, and teaching methods. On the other hand, there is little evidence that the alumni value the theoretical parts of their programs, including scientific inquiry, in contrast to what research says is essential and what national regulations demand. Differences in replies between the three programs are also discussed and related to the features of the programs.

ARTICLE HISTORY

Received 7 July 2023

Accepted 22 January 2024

KEYWORDS

Teacher education; alumni; leadership; theory; practice

1. Introduction

There is a nearly constant call for change in initial teacher education (ITE) from politicians, educators, the public, and researchers (Ball & Forzani, 2009; Yeigh & Lynch, 2017). These calls often point in very different directions. However, they all start with the reasonable belief that ITE impacts teacher qualifications and teaching in school. This is supported by the results of Darling-Hammond (2000) that concludes that certified teachers with more preparation for teaching are generally more successful with students than teachers with little or no such preparation, despite shortcomings in current teacher education programs. But which changes to ITE would improve the effectiveness of teacher education and prepare them better for the job?

In this article, we want to contribute to this discussion by lifting the alumni's perspective on their own education, as others have before us, e.g., Jakhelln et al. (2021), Mayer et al. (2015), Whitney et al. (2002). Using alumni's description of what competencies ITE has helped them develop and what their jobs demand, we want to identify aspects of ITE where changes would be most beneficial and where the alumni feel the most pressing need for change. We do not study retention issues but instead focus on active alumni's thoughts on how ITE has prepared them for their work.

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1.1. Research questions

This exploratory study aims to contribute to the understanding of what alumni see as crucial in teacher education. The research questions are:

RQ1: Which features of teacher education do alumni think have contributed most in preparing them for a teaching career?

RQ2: What do alumni think was lacking in their education, given their professional needs?

We study alumni from three different ITE programs, that lead to the same teaching credentials for STEM subjects in secondary schools in Sweden. We investigate how the characteristics of the programs influence the alumni's impression of preparedness. Variations between the three programs reveal general features that impact the quality of education. We hope that the conclusions of this study can lead to insights into alumni's perspectives on a range of ITE programs with similar features, and help teacher educators and policymakers in developing teacher education.

2. Background

It is notably difficult to compare the strengths and weaknesses of different teacher education programs (Cochran-Smith & Zeichner, 2005), both because different programs attract and graduate different types of students and because societal factors outside the programs influence the development of student teachers and the quality of their teaching. There are methodological complications such as the difficulty in isolating the educational programs' impact on student achievement, a lack of variance in easily measurable teacher characteristics, making it difficult to establish causal relationships, and to compare graduates as they take employment in schools where the educational challenges differ (Wiens, 2012). One proxy measure for the effectiveness of teacher education is the alumni's perception of how well-prepared they are for teaching.

Despite the difficulties, a lot of research attempts to describe the effects of teacher education, using both small case studies and large national or international comparisons. For example, SETE (Studying the Effectiveness of Teacher Education), a large-scale Australian study of how newly graduated teachers and their principals perceive the effectiveness of teacher education (Mayer et al., 2015), showed that teachers generally felt well-prepared by their studies and believed they were effective as teachers. While the results differed somewhat depending on which type of program the student had attended, with students from Bachelor's or Master's programs feeling better prepared than those with a Graduate Diploma, the study could not distinguish the effect of particular content taught during the ITE.

One way to identify factors that influence the outcome of teacher education is to study programs with varying formats working within similar conditions, to bring to light salient features. In Andrew (1990), for instance, two closely related programs at the same institution, one bachelor's and one extended 5-year program, are compared using retention data and questionnaire responses from alumni. The author found that alumni from the extended program stayed in teaching longer and expressed more satisfaction regarding their career choice and the quality of their ITE, as well as higher confidence in their teaching abilities. Explaining the differences involves considering both the program content and the recruitment of students to the programs, as the 5-year program entailed a longer practice period and was more selective in its recruitment.

Of all the factors that are identified as challenging in ITE, we now choose to focus on research about those factors that are most prominent in our data. One aspect that novice teachers consistently rank as one of their most pressing concerns is classroom management (Hoy & Weinstein, 2013). Stough (2006) found that instruction on classroom management is sparse in ITE in the USA. Wubbels (2011) claims that there is no indication that the situation differs in Australia, the UK, or the Netherlands. A frequently cited definition of classroom management originates with Evertson and Weinstein (2013) and was extended and reformulated by Wubbels et al. (2014) as

the actions teachers take to create an environment that supports and facilitates both academic and social-emotional learning. This definition includes leadership aspects that are not always included in the term management. Expanding this further, relating the role of leadership in the classroom to other forms of leadership, Bengmark (2023) building on Mackenzie (1969), suggests three main leadership competencies for teachers. These are *Goal-setting and Decision-making Competency*, i.e., formulating goals and choosing strategies and methods to reach them, *Organizational Competency*, i.e., getting processes and tools in place, and finally *Influencing Competency* i.e., the ability to make people strive toward the goals.

Studies have found that the relationship between theory and practice in ITE is seen as problematic by alumni (Whitney et al., 2002). Alumni perceived a gap between theory and practice, where practical parts of their education were described as having a strong impact on their teaching. In contrast, the benefits of studying educational theory were not clear. Jensen (2020) discussed research on practice-based coursework, beyond practicum, in Norwegian and Finnish teacher education, which aims to bridge the gap between theory and practice by enacting practice-related activities in university-based courses. Courses in teacher education that focus on practical aspects of teaching are often referred to as teaching methods courses and can include established practices for teaching specific content as well as concrete advice on classroom management. Studies have found that teaching methods courses can have a positive effect on teacher students' self-efficacy (Brand & Wilkins, 2007; Huinker & Madison, 1997; Quinn, 1997). On the other hand, foundation courses that focus on general theory, didactics, knowledge of learners, educational psychology, and knowledge of the purposes of school, taken from history and philosophy of education, are often challenging for students to apply in their teaching.

Many ITE programs include scientific inquiry and scientific methods in educational research, e.g., a thesis project or involvement in action research. Arguments for practicing scientific inquiry as part of ITE include relating theory and practice, taking into account the many variables that influence the work of a teacher, and observing from the perspectives of different actors involved (Darling-Hammond, 2000). In interviews with teacher educators in Norway, the value for teachers of learning to participate in research is emphasized. In contrast, educators are more skeptical about training student teachers in particular teaching strategies (Hammerness, 2013). When asked about the impact of research on their competence as a teacher, newly qualified teachers in Finland and Norway recognize the role of a research base, both for establishing knowledge in educational science and for giving them tools to consider their own practice with a critical eye and find methods to improve continuously (Jakhelln et al., 2021). In Sweden, knowledge of theory and scientific methods for educational research is required in the national learning goals for teacher education and an important factor in national evaluations of teacher education, crucial for accreditation of programs. Educational research is integrated into ITE programs in the form of reading and discussion of established results, the study of methodology, and an independent experimental study at the Master's level.

2.1. Three different teacher education programs within the same framework

The authors' department is involved in three different teacher education programs for secondary school. The overall learning goals and the specification of credits in three areas, i.e., core educational studies, practicum, and subjects, are defined by national regulations (Higher Education Ordinance 2021:929, Annex 2, 2021) and are hence identical for the three programs. Core educational studies amount to a year's full-time studies with specified thematic content. Practicum time adds up to one semester. For teaching in upper secondary school, students need university studies in one or two school subjects. The equivalent of two years of study is required in the first subject and in the second subject an additional one and a half years. Altogether this amounts to 5 years of study to become an upper secondary school teacher in two subjects. The three programs described below have implemented this scheme differently, and all three lead to national credentials for teaching

STEM subjects. The Accelerated program follows a consecutive model. After completing studies in the teaching subjects, the student applies to study a one-year program (including a summer term) with a 125% course load. The program started as a part of a special national effort to attract and educate new teachers in fields where the state anticipates teacher shortage. Entrance requirements include studies in a STEM subject at the bachelor level, beyond the strict subject requirements for teaching credentials. It attracts students with bachelor's-, master's- and even Ph.D. degrees, many with extensive high-level work experience. One feature of the program is that the students share their time between school practicum and university studies daily during the whole program.

The double-degree program is also a consecutive program that starts with 3–5 years of engineering studies followed by 3–4 semesters of core educational studies and practicum, leading to a double degree in engineering and education. Interviews are used as part of the admission process to the latter part, and there are special requirements in two subjects: mathematics and one of physics, chemistry, or technology. Ties to the engineering world remain strong, with some of the alumni going on to teach in secondary school while others take teaching-, leadership- or development jobs in industry. The double-degree program combines teaching practice in schools with project management and practicum in other learning environments, such as science centers or industry.

The concurrent program is a 5-year program with alternating periods of subject courses in two school subjects (inside or outside of STEM), core educational studies, and practicum. The concurrent program does not require previous university studies. It attracts both youths straight out of high school and more experienced students whose primary interest is to become teachers. Some are personally interested in the school subject while others focus on working with teenagers. Competition for entrance to the program is relatively low. The program includes four 3- to 7-week full-time periods in a school, spread out over the five years.

While all three programs include core educational courses with similar structure and teacher practice in similar school environments, they implement the components, such as practicum, differently and recruit students from different groups. With a common regulatory framework, overlapping teaching staff, and different implementations, they offer the opportunity to compare and contrast programs. We were interested in following up with the students to see how the characteristics of the three programs play out for alumni and to reflect on what can be learned from the bigger picture. More generally, observations from these examples in the Swedish context can illuminate the output of other secondary school teacher education schemes within STEM or other subjects.

3. Method

This study is part of a survey study with 93 respondents, all of them alumni from one of the three ITE programs described above. The answers used here are of free-text type; hence, the primary analysis method is qualitative. However, we also report on the numbers of replies in different categories to indicate relative frequencies for certain types of answers.

3.1. The instrument

The questionnaire was delivered digitally in the Fall of 2018, and responses were given online in a licensed, professional online service for questionnaires. It was administered in Swedish. The full survey consists of three parts: alumni experience when entering the job force, alumni experience from the ITE, alumni thoughts about their future, and further development. It contained 24 questions and was developed for a more comprehensive study of alumni experiences than what is reported in this text. The questionnaire was first piloted on five in-service teachers in paper format, after which minor revisions were made.

In this report, we focus on the replies to two free-text questions, questions 15 and 16, translated below, exploring the alumni's thoughts on the strengths and weaknesses of their teacher education.

15. What in your studies at the program have you benefited most from in your profession? Feel free to mention concrete competence areas, course elements, or the like.
16. Given the skills needed in your professional role today, what do you wish you had had more of in your studies at the program?

3.2. Total population and respondents

A list of all students who had started their studies in 2011 or later in each of the three programs and who nominally should have completed their studies was produced. People who had dropped out of their program were excluded, but no checks were made for the remaining persons of whether each one had completed all the courses, obtained a degree or where actively teaching. For the three programs together, this list consisted of 203 alumni who were invited by email to respond to the questionnaire. Two reminders were sent before the data collection was stopped. The number of replies was 93, giving a response rate of 46%. Numbers of responses and rates program-by-program are given in Table 1.

3.3. Method of analysis

We conducted a thematic analysis of the responses. In the first step, the three authors individually processed the answers to the two questions by first partitioning all the answers into separate entities, here called items, seen as referring to separate benefits or wishes. After that, each researcher individually constructed a set of categories representing their interpretation of the answers and placed each item in only one of the categories. In the second step, the authors compared their partitions of responses into items and their categorization of items. Any discrepancy found in this process was debated until a common partition into items and a common categorization, in which each item fit into one of the categories, was agreed upon by all three authors.

The partition of the answers gave a total of 169 items for question 15 and 116 items for question 16. Almost all (282 out of 285) items were categorized into the seven emergent categories, common for the two questions. The categories are *leadership*, *practicum*, *didactics*, *teaching methods*, *assessment*, *personal development*, and *subject*. These are described in the next section, with translated examples of responses.

As an example of the analysis, consider the following answer to question 15: *To be able to figure out someone else's knowledge/background and explain based on their knowledge, and design something that matches that person's views, and to be able to organize and lead a group*. This was divided into items: *to figure out someone else's knowledge/background*, *explain based on their knowledge*, and *design something that matches that person's views, and able to organize and lead a group*. These three items were placed in the categories *assessment*, *didactics*, and *leadership*, respectively.

The items' connections to individual respondents are not used in this analysis, but the connection to each respondent's education program is of central interest.

4. Results

In this section, we describe the seven categories that emerged in the analysis of the survey responses, give examples of responses, and show response frequencies for each category. Frequencies for

Table 1. Response rates for the three ITE programs included in this study.

Program	Recipients	Replies	Response rate (%)
Accelerated	91	43	47
Double degree	62	36	58
Concurrent	50	14	28
Total	203	93	46

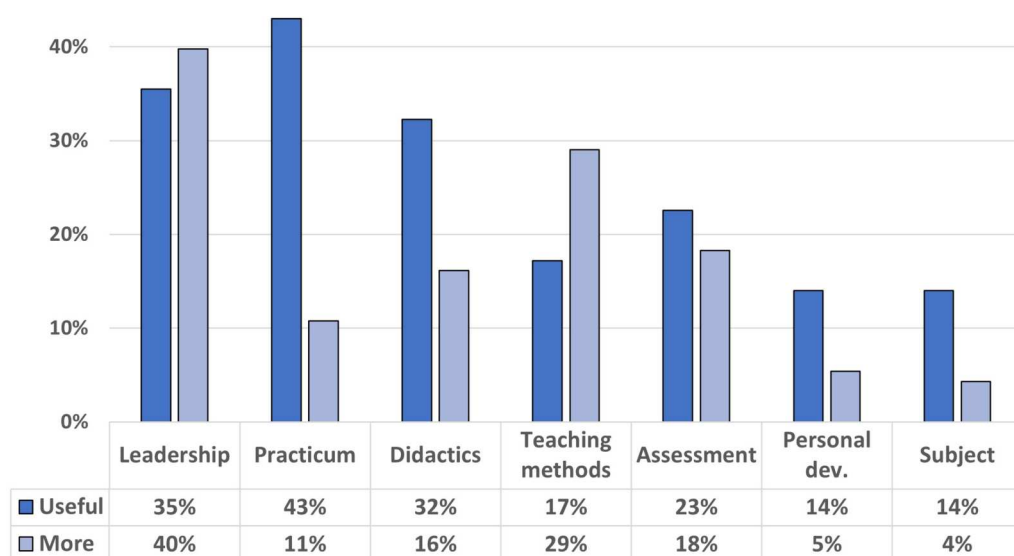


Figure 1. Percentage of respondents for each category (from all three programs). *Useful* refers to question 15 and *More* refers to question 16. The number given is the percentage of respondents for which at least one item is put in the category.

occurrences of each category for all respondents are shown in Figure 1, and separately for each program in Table 2. We treat separately the responses to Question 15, where alumni were asked what parts of their study program they found most useful in their profession, and Question 16, where they were asked what they wished they had studied more of, given their current professional needs.

4.1. Leadership

In the leadership category, we find items pertaining to leadership in general terms such as *lead a group* and *initiate changes and facilitate them*. We also find more specific responses that fit into the sub-competencies of leadership (Bengmark, 2023). One group of items is about influencing people/students, making them work, giving feedback, and managing emotions, including items such as *relationship building*, *creating a good climate*, as well as *uninterested students* and *motivate*, and difficult social situations with items such as *dealing with racist and abusive situations*, *mediating between colleagues*, and *dealing with people with diagnoses*. We also included responses referring to contacts with parents and understanding behavior, e.g., *developmental psychology*, *a sociology course*, and *personalities*. The second group of items relates to organizing time and other resources,

Table 2. Percentage of respondents for each of the seven categories (left column).

Category	Accelerated (N = 43)		Double degree (N = 36)		Concurrent (N = 14)	
	Useful (%)	More (%)	Useful (%)	More (%)	Useful (%)	More (%)
Leadership	30	47	50	33	14	36
Practicum	47	14	42	6	36	14
Didactics	44	26	19	3	29	21
Teaching methods	14	37	25	19	7	29
Assessment	40	23	6	11	14	21
Personal development	5	7	28	6	7	0
Subject	2	0	11	8	57	7

Note: For each program (top row) the column with heading *Useful* refers to question 15 and the column with heading *More* refers to question 16. The number given is the percentage of respondents for which at least one item is put in the category.

with responses such as *organizing* and *knowledge management*. We also include aspects of classroom management such as *student situations to deal with* and *how to handle a whole class*. The third and final group that we counted as leadership is about curriculum and regulations setting the goals for teaching.

4.2. Practicum

Practicum, also called clinical work or internship in other texts, is a central part of teacher education, as evidenced by responses such as *learn by practicing*, *practicum gave the most/regular courses nothing*. Other items concern specific practicum elements that alumni thought made it valuable, such as *conversations with peers during practicum* and *conversation with the headmaster*. Some respondents commented on how the practicum is organized, e.g., *need a greater breadth of practicum schools, I did not get to practice my second teaching subject, the week at the Science Center gave me a lot*. Finally, some alumni specified knowledge they found valuable, e.g., *from practice, I have with me what works and what doesn't, responsibility for others, taught me to communicate, reference material, tasks other than teaching*.

4.3. Didactics

The didactics category describes, in one respondent's words, *ways to think about teaching and learning*. We include in the category some very wide descriptions, such as *theories of learning* or *psychology* and *cognitive development*, as well as examples of theories such as *variation theory* and *neurodidactics*, and general issues such as *communication in the classroom* and *rhetoric*. What distinguishes it from the associated teaching methods category is the latter's direct practical orientation. All three teacher education programs include courses specifically focused on particular subjects' didactics (mathematics, science, or technology teaching), which respondents refer to specifically. Respondents also mention teaching strategies they may have met in university courses or during practicum, e.g., *teaching for language development*, *using IT to support learning*, *backward design*, or *systematic quality development*. Some challenges are mentioned regarding *special needs* or *neuro-psychiatric functional disorder*.

4.4. Teaching methods

The teaching methods category focuses on preparing for concrete classroom action, *teaching as a craft*. Teaching methods are not necessarily based on research but can be grounded in *teachers' documented experience*. Alumni mention *how to*, *concrete teaching advice*, and *examples that work (from school)*. They also mention specific events from the program, e.g., *the seminar where we discussed dilemmas*. They describe their activities as teachers: *using the whiteboard*, *starting up a lesson*, *finding teaching material*, *thoughts about lesson planning*, or *course design*, and mention specific teaching methods, such as *applying flipped classroom* or *active learning*. Practical advice on student issues, such as *strategies and practical information for dealing with heterogeneous student groups* or *strategies to support students with special needs*, are also classified in this category. However, classroom management issues such as *student situations to deal with*, or *order in the classroom* were classified into the leadership category.

4.5. Assessment

Some responses focus on skills and knowledge related to assessment. Some of these are of a general nature, such as *the assessment course*, but most point to more specific aspects of assessment. One of these aspects concerns formative assessment and how assessment can inform teaching. This includes responses such as *formative assessment*, *being able to familiarize me with someone else's*

knowledge/background, how do you plan a course where you get the opportunity to assess all competencies? Another aspect focuses on tests and grading, e.g., *scoring and competencies, assessment according to the assessment rubrics*. Alumni also write about getting students to understand the assessment. An example of a comment is to *make the students understand what the competencies mean and how they can develop them*. The final aspect is related to the methods category discussed above, wishing for *concrete examples of assessment from school and practice writing good test*.

4.6. Personal development

The sixth category has been named Personal Development. It contains responses that pertain to self-awareness, personal characteristics, and identity, with answers such as *self-reflection, patience and respect, change of perspective*, as well as issues of quality of life, such as *finding balance in life, prioritize, and burning out*.

We also include aspects of general transferable skills, e.g., critical thinking, the writing process, learning to network, and contact with peers.

4.7. Subject

Courses with a focus on content knowledge in STEM subjects account for more than half of the respondents' university studies, whether it is integrated into the concurrent program or prerequisite in the double-degree and accelerated programs. As one respondent puts it, they provide *the competence that is easiest to pinpoint*. In our data, alumni mention *subject studies* as a whole as well as specific courses or contents, e.g., *I learned about problem-solving and geometry, mathematical models, and more programming*. Some alumni express how content knowledge affected their self-efficacy, e.g., *Deep knowledge gives me assurance when I teach (self-confidence and a professional attitude)*. Note that the survey questions were formulated as pertaining to *your studies at the program*, where the accelerated and double-degree programs do not formally include subject courses. We notice that 8 of the 17 items pertaining to the subject category come from students from the concurrent program, even though they represent only 15% of respondents. We will therefore abstain from further analyzing this category.

5. Discussion

This study aims to contribute to the understanding of the effectiveness of teacher education by studying what alumni express as useful or desirable in a Swedish context. We identify the factors in ITE that are most prominent in the eyes of the alumni. The discussion below is divided into two parts. We first discuss each category and consider interactions and dependencies between categories. We then consider methodological questions.

5.1. Discussion of results

5.1.1. Leadership comes first

Leadership was the most frequent category among the responses, as a whole, and for each program. It was the second most frequent category mentioned as useful (33 of 93) and the top choice among wishes (37 out of 93), compared to Figure 1. Hence, many of the respondents feel the need to further develop their leadership skills, even though many of them acknowledge that their education included useful content on leadership, as exemplified by the following response: *This is also something that you should spend much more time on, i.e., how do you manage order in the classroom* (R20). This is in line with previous research, stating that classroom management is a pressing concern for novice teachers in many countries (Hoy & Weinstein, 2013; Stough, 2006; Wubbels, 2011). Our results indicate that Sweden belongs to the countries with insufficient focus on classroom

management in ITE, and hence could improve teacher preparation by including more work on leadership.

The double-degree alumni were more frequent (18 of 36) in emphasizing the usefulness of what they had learned about leadership than the other programs (15 of 57). Their program includes an unusual amount of explicit leadership development compared to other ITEs in Sweden. The program, entitled *Learn ing and Leadership*, explicitly aims at preparing the students for leadership in the classroom, as well as in the industry where some of them pursue a career. Only from alumni from this program do we find more responses expressing usefulness than wishing for more. This indicates that the program is successful in its teaching and satisfies more of the needs that students experience.

5.1.2. *Practicum is highly valued*

As described in Jensen (2020), alumni in this study showed a strong appreciation for practice-based parts of their curriculum. Practicum was the most frequent category cited as a useful part of education (40 of 93). There was a uniform opinion that the quantity of actual teaching during practicum is valuable. As expressed by one respondent: “I have felt very well prepared in my professional life, especially from the practice in schools where an important factor was that I got to do a lot of teaching myself” (R69).

Concerning the specifics, there were more diverse opinions. For example, some responses highlighted the need for varied placements over time, while others emphasized the value of consistency. Illustrating also differences in opinions, from the programs where the students are placed in pairs during practicum, one comment was: *[It] is a completely unrealistic situation compared to the professional life that then awaits* (R36), while others saw it as an advantage: *I have benefited from practicum and especially that I did practicum together with other teacher students. [...] It was very instructive to see each other grow as a teacher and give each other feedback* (R4).

Interestingly, respondents gave longer, more detailed responses related to practicum than answers in the other categories, addressing specific organizational issues and examples of concrete situations. This might reflect their being active and especially emotionally engaged and that practicum produced vivid memories that stick out when alumni gather recollections of their studies.

5.1.3. *More focus on teaching methods than on didactics*

Almost a third of the respondents (30 out of 93) answered that they found didactics especially useful, while half as many (16 of 93) mentioned teaching methods as an important part of their studies. Responding to what they wished for, one finds the opposite proportions, as about half as many requested more on didactics (15 of 93) than more on teaching methods (27 of 93). Reading the details in their free text responses, we see that alumni also express that the didactics is too theoretical and that they want more useful methods. This is in line with the results of Whitney et al. (2002). One response to question 16 included: *Concrete methods. [...] More focus on practical use in the school environment and less focus on research* (R52). This indicates that the alumni believe that there is a need to strengthen the content on teaching methods to better prepare them for their professional life.

Respondents from the Accelerated program show a greater appreciation of didactics (19 of 43) than the other programs (11 of 50). Unique features of this program are that, firstly, the student has practicum part-time daily for almost the whole year. Secondly, several university teachers involved in the practicum also teach the didactics courses. We believe this helps the students connect the theory with practicum. On the other hand, the double-degree program has more students mentioning the usefulness of teaching methods than that of didactics, opposite to the alumni from the other two programs. Indeed, this reflects the content of the double-degree program, which starts with a purely teaching methods-oriented course and progresses toward more theoretical didactics. It also features master teachers, i.e., experienced schoolteachers who support students during practicum and teach methods courses. This is illustrated by the following response on what was most valuable:

Lectures by master teachers with a focus on lesson plans and course design (R58). The other two programs do not have separate teaching methods courses. During their studies, mathematics students in the concurrent program perceive courses in didactics and methods as less challenging and less important than subject courses and are less assiduous in their participation. In this survey, a large proportion of the respondents expressed the wish for more teaching on didactics and even more on methods, sending a clear message that the didactics and methods part of their education could be further developed.

5.1.4. Fewer comments on assessment and personal development

The remaining categories, assessment and personal development were much less frequently cited by the alumni. Somewhat less than a quarter of the students (21 out of 93) expressed that their learning about assessment was among the content they found most useful. Fewer wished for more on assessment (17 of 93). This despite the fact that Swedish teachers exercise public authority in their assessment and that the grades they give are the basis on which their pupils are accepted to higher education, hence having a high impact on the pupils' future.

The number of respondents pointing to the usefulness of personal development is on the low part of the spectrum (18 of 93). It is noticeable that the proportion is much higher for the double-degree program (10 of 36) than for the other two programs (3 of 57). The double-degree students experience a dramatic epistemological shift from engineering studies to social sciences. Even though the Accelerated program also is a consecutive program, its alumni point to personal development to a much lower extent (2 of 43). The difference may be related to Burns (1992), showing that despite studying the same content, a group with in-class discussions on the effects of education on personal development showed more significant improvement on the Personal Growth Inventory than other groups that did not have such discussions.

5.1.5. Tension between practice and theory

If we consider the responses in our study, then we see very clearly that the alumni write mainly about the practical end of the practice-theory spectrum. We find little evidence that they value the theoretical parts of their pedagogical education, or its connections to research, as exemplified by the comment:

In short, at the university, we talked a lot about theory and research, but we rarely applied it in a relevant way. It is as if the university is afraid to give concrete suggestions, with the risk that students would interpret the tools as truth, instead of trusting that the students are professionals and can differentiate/combine tools based on needs if they are allowed to practice using them. In my professional life today, I learned more in a couple of months in the profession than I did at the pedagogical department for several years (again, the subject studies were of value, but the pedagogy was substandard). (R100)

This is in line with previous research where alumni point to the impact of the practical parts of their education while questioning the influence of theory (Whitney et al., 2002).

On the other hand, Darling-Hammond (2000) describes successful programs as those which include scientific inquiry, and Jakhelln et al. (2021) study the central role that a research base in ITE is meant to play in teacher competence and show different interpretations of this role expressed by newly qualified teachers in Finland and Norway. There is also an argument that school children's scientific literacy is important, in order to instill a scientific approach to knowledge, making it necessary for teachers to have first-hand experience with scientific inquiry. The Swedish Higher Education Ordinance paves the way for a research-based teacher education, as in Finland and Norway, requiring ITE students becoming secondary school teachers to "demonstrate specialized knowledge of the theory of knowledge and qualitative and quantitative research methods as well as the relationship between the disciplinary foundation and proven experience and its significance for professional practice" (Higher Education Ordinance 2021:929, Annex 2, 2021). ITE programs include independent projects with scientific inquiry, equivalent to half a year of full-time studies.

However, the alumni in our study do not mention scientific work, neither related to their subject nor to educational sciences, be it others' research or their own inquiries from their Bachelor's or Master's thesis. Hence, our respondents do not seem to share the view of researchers and the national authorities that conducting scientific inquiry as a student contributes an important way to their preparation for the teaching profession.

This leaves teacher educators with the challenging task of changing how research is embedded in ITE in such a way that students will appreciate its role.

5.2. Ethical and methodological discussion

The data collection for this study has been performed in alignment with the ethical research guidelines from the Swedish Research Council (2017) and the Declaration of Helsinki, including introducing the aim of the study to the recipients and asking for consent, which all respondents approved. The data has been stored in a dedicated area only accessible by the three authors. No sensitive data was expected or handled in this study, and all participants are adults. Due to these circumstances, no ethical approval was deemed necessary.

This study used free-text questions to gather alumni's thoughts, striving to minimize the researchers' influence on the respondents' answers by not giving a list of possible or suggested answers. On the other hand, one source of bias with free-text questions is that respondents seem less likely to think of something they have had very little exposure to. We see instances where many alumni who wish for more of a topic come from the program where this topic has gotten the most attention. For example, assessment is both more studied and wished for by alumni from the Accelerated than by others. We have refrained from drawing conclusions in such cases. As the response rate for this study is 46%, we also keep away from strict statistical reasoning, but rather consider the different opinions expressed to find what is seen as useful and what is seen as insufficient by the respondents as a group.

The response rates vary widely between the different programs. This may reflect the students' sense of belonging to the program. In particular, students in the concurrent program study at different faculties and in different student configurations under periods in their 5-year program, while double-degree program students form a tight group with close contact with program leadership. That there are not very many responses makes it less fruitful to study the programs separately. Still, the relatively high total response rate yields valuable results and the opportunity to discuss alumni's concerns.

As for the analysis, the choice of categories emerging from the data is dependent on how we grouped and interpreted responses. For example, what is viewed as leadership is not clear-cut. In our leadership category, we have included responses related to managerial parts of classroom management, such as structure and order, and aspects of influencing and motivating students. With this approach, leadership is strongly associated with formative assessment as this aims at influencing the learner's future work. Hence, we have actively searched for whether the respondents intended to point to the assessment part of the formative assessment or the feedback part and categorized the answer accordingly. One must also be aware of the possibility that the alumni fail to see aspects of leadership included in their program, e.g., in the context of formative assessment.

One deliberate limitation of this study is that the respondents are all teachers in STEM subjects. However, the specifics of the subject matter are not central in their response, which suggests that the results can also be relevant for secondary school teachers in other subjects. Duplicating this study with teachers in other subjects could show if this is the case.

Another limitation is that this article has not included questions regarding the relationship between the three phases of learning as a teacher: ITE, induction, and life-long learning. We believe that, in addition to developing teacher education to better prepare teachers, there is a need to better understand the relationship between teacher education and the initiation process at the workplace

and then in-service training, to better build the competencies of teachers over their careers. The relationship between these three parts needs further investigation and development.

6. Conclusion

This study identified two areas where improvements in our programs would correspond to student aspirations: leadership and the relationship between theory and practice. Since the same areas have been identified as problematic in other research literature (Whitney et al., 2002), we believe that other programs would also benefit from giving these areas special attention.

Our data indicate that alumni feel insecure about their leadership competencies for classroom leadership, but also that one program with more focus on leadership better fulfills student expectations. This can inspire teacher educators to give leadership issues special attention, in both initial training, induction, and in-service training.

As for the relationship between theory and practice, if we believe that pedagogical theory and educational sciences should play an important role in teacher education, we need to make its value more visible to the teacher students, to help students see how theory plays a role in supporting them in their growth as teachers. One way to accomplish that may be to more clearly let theory be grounded in practice during ITE, as suggested by Grossman et al. (2009), Jensen (2020) and Ball and Forzani (2009). Another possibility is to postpone scientific inquiry and some theory until later, when the alumni can use it in self-development, making it part of a lifelong learning process.

Disclosure statement

No potential conflict of interest was reported by the authors.

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