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APPENDIXES
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Regional Educational Laboratory Northwest
At Education Northwest

Professional Development Incentives for Oregon's Early Childhood Education Workforce: A Randomized Study

See https://go.usa.gov/xFRyG for the full report.

Appendix A. About the study

This appendix includes additional background information on early childhood education (ECE) workforce education and wages nationwide, ECE workforce education and wages in Oregon, national initiatives to increase ECE workforce education, career lattices and workforce registries, and Oregon's workforce registry and career lattice. In addition, it provides a review of the research literature on the implementation and effectiveness of information campaigns and financial incentives related to the interventions used in this study.

Education and wages of the early childhood education workforce across the country

While nearly all states have identified a core set of competencies and skills required for the ECE workforce, there is no consensus across states on how those competencies and skills translate into minimum education requirements or credentials or on the requirements for different types of workplaces (for example, home-based care versus centers; Whitebook et al., 2016). As of 2016, only 11 states had a minimum credential or vocational requirement for ECE professionals who are employed outside public preschool systems (Oregon is not one of the 11); most states require only a high school diploma and, in several cases, some additional training (Whitebook et al., 2016). These minimal requirements do not reflect what the science of child development suggests ECE workforce members need in terms of specialized knowledge and competencies (National Research Council, 2015). As a result, ECE professionals "… need access to high-quality professional learning that supports them in the acquisition and application of the competencies they need, both in degree- and certificate-granting programs and during ongoing practice throughout their career" (National Research Council, 2015, p. 494).

Many ECE professionals across the country attain the Child Development Associate (CDA) credential, a nationally recognized entry-level ECE credential based on a set of competency standards, which is administered through the Council for Professional Recognition. According to the council, more than 370,000 individuals have received the CDA credential (Council for Professional Recognition, n.d.), and there is suggestive evidence that children taught by providers with the CDA credential experience some positive academic benefits—in, for example, color, number, and letter identification, as well as rhyming—compared with children taught by providers without the credential (Early et al., 2006).

Nationwide, the ECE workforce has lower educational attainment than K–12 teachers. Only 46 percent of preschool teachers age 25 and older have at least a bachelor's degree compared with 95 percent of elementary and middle school teachers. About 16 percent of preschool teachers have an associate degree, 24 percent have

some college experience (with no degree), 13 percent have a high school diploma or equivalent, and 1.6 percent have less than a high school diploma (U.S. Department of Labor, 2018). Among ECE workforce members who are not preschool teachers, educational attainment is lower still: only 19 percent of nonpreschool ECE workforce members have at least a bachelor's degree, 11 percent have an associate degree, 27 percent have some college experience (with no degree), 31 percent have a high school diploma or equivalent, and 13 percent have less than a high school diploma (U.S. Department of Labor, 2018).

Wages for ECE professionals are also low. Nationally, the 2016 median annual wage was $28,790 for preschool teachers ($13.84 median hourly wage; U.S. Department of Labor, 2017a) and $21,170 for other ECE workforce members ($10.18 median hourly wage; U.S. Department of Labor, 2017b). The median annual wage was $57,160 for elementary school teachers and $59,170 for secondary school teachers (data on hourly wages were unavailable; U.S. Department of Labor, 2017c, 2017d).

Education and wages of Oregon's early childhood education workforce

Oregon's licensed-care ECE sector employs roughly 25,000 people. About 75 percent of them work in centers (including public preschools and Head Start facilities), 13 percent work in large home-based care settings, and 12 percent work in small home-based care settings. The sector includes infant/toddler care as well as care for 3- and 4-year-olds. Approximately 30 percent of Oregon's ECE workforce reported an education level of a high school diploma or GED or below (Oregon Center for Career Development in Childhood Care and Education and the Oregon Childcare Research Partnership, 2019). About 35 percent of ECE workforce members who provided education data to the Oregon Registry Online reported having a bachelor's degree or higher, while 13 percent had an associate degree and 22 percent had some college, a certificate, or a credential (such as the CDA). These figures include all licensed early learning professionals (both preschool and child care workers), although 27 percent of the licensed ECE workforce did not self-report an education level (Oregon Center for Career Development in Childhood Care and the Oregon Childcare Research Partnership, 2019). Center-based staff members tended to have higher education levels than other ECE workforce members, while staff members in home-based care settings tended to have lower education levels (Portland State University & Oregon State University, 2017). Annual mean wages in Oregon were similar to national wages, at $30,230 for preschool teachers and $24,460 for other child care workers (data on hourly wages were unavailable; U.S. Department of Labor, 2017e).

National initiatives to increase the education of the early childhood education workforce

Multiple initiatives in the United States seek to improve the quality of the ECE workforce and the training its members receive through both formal education pathways and professional development opportunities (Gomez et al., 2015). While a clear link between higher ECE workforce education and child outcomes has not been established—results from prior research are mixed and suffer from study limitations that prohibit causal interpretation of the findings (National Research Council, 2015)—state policy leaders hypothesize that increasing the education level of the ECE workforce (particularly of workforce members with less than an associate degree) will result in higher quality care for children (Manning et al., 2017). They also hypothesize that ongoing professional development is useful for ECE professionals at every education level (Manning et al., 2017). Efforts to improve training for the ECE workforce often include financial incentives—including scholarships and education awards—to encourage participation in formal education or professional development that is linked with career pathways (often referred to as a career lattice; Ackerman, 2004). These incentives might help achieve a higher quality and more stable workforce (Totenhagen et al., 2016). However, there is little research to inform the appropriate design of these incentive approaches, especially regarding what levels or types of incentives are most effective at achieving a more highly qualified workforce.

Career lattices and workforce registries

Policymakers and researchers have recognized the need for systems of professional development that incorporate career pathways for ECE professionals. As such, career pathways have become a common feature of state professional development systems across the country (Karoly, 2012; LeMoine, 2008; Limardo et al., 2016). These initiatives to bring professional development systems to ECE workforce members are part of broader efforts to professionalize the field given the relatively low beginning education level and specialized knowledge among ECE workforce members (Allen & Kelly, 2015). Career pathways outline professional development steps that individuals can follow, including key milestones such as credits or degrees earned or certified training hours completed. Some pathways include financial incentives tied to the achievement of key milestones. Career pathways serve the dual purpose of meeting both the education and professional development needs of the ECE workforce while meeting the sector's needs for an educated and skilled workforce (Limardo et al., 2016).

ECE workforce members might choose to engage in professional development to increase their knowledge and skills in the field, meet licensure or other professional requirements, advance in the profession, earn higher wages, or some combination of these factors. Karoly (2012) further highlights the unique need for engagement in professional development among ECE workforce members: "… many ECE providers begin caring for children before they have had formal professional development, often as classroom assistants or home-based providers" (p. 6).

Career pathways, ladders, or lattices have become a prominent feature in many state ECE systems, with 37 states having some form of career pathway that outlines the trainings and experiences necessary for ECE professionals to advance their career in defined ways (Missouri Department of Social Services, 2014). A workforce registry is another key component of a robust state professional development system for ECE workforce members, as it supports both the monitoring and the evaluation of the professional development system through the tracking of ECE workforce members, their education level, credentials, training experience, employment history, and position on the career ladder (Karoly, 2012). As of 2018, 42 states and the District of Columbia and Puerto Rico had an ECE workforce registry (King et al., 2020; Limardo et al., 2016). However, across all registries, only 69 percent of licensed centers had at least one director and one staff member in the registry, and only 44 percent of licensed center directors were in the registry (Mayfield, 2017). This indicates a lack of workforce registry participation, which could hamper state monitoring and evaluation of the state professional development system. In at least 10 states, including Oregon, registry sign-up is mandated only for staff members in licensed ECE programs. In other states registry sign-up is voluntary regardless of workplace setting (Ackerman, 2016).

Oregon's workforce registry and career lattice

The Oregon Center for Career Development in Childhood Care and Education (OCCD), based at Portland State University, manages professional development incentive disbursement, as well as the registry system that documents the licenses and professional development of ECE professionals and the career lattice. The registry has existed since 1998 and, since 2011, has been managed as an online system called the Oregon Registry Online. All workforce members in regulated child care centers and home-based care facilities must be registered to provide care to children and must submit documentation of their training and education to the registry.

OCCD has developed a career lattice that outlines a series of 15 steps representing milestones for those in the ECE workforce, such as earning a degree, certificate, or credential (see table B1 in appendix B). There are three tracks (degree, credential, or certificate; college course credit; and community-based training), providing multiple pathways to move up the lattice. For example, ECE workforce members who are at step 7 have the CDA credential, 12 college quarter credits or 120 hours of community-based training. To move to step 7.5, they would need to earn 8 additional college quarter credits if they have the CDA credential or earn 12 college quarter credits or 80 additional hours of community-based training if they have 120 hours. The career lattice helps break up the

pathway to a higher degree or equivalent training hours into more easily achievable steps that delineate cumulative college credits or hours of community-based training needed. For example, the step after earning the CDA credential requires earning eight additional college quarter credits, which is the equivalent of two or three classes.

Oregon Registry Online registrants sign up for the career lattice and submit documentation of their education level and training hours. This documentation is reviewed by OCCD staff, who then assign a step in the lattice to the registrants based on their accumulated education and training. Until April 2020 OCCD offered an incentive program based on the step level achieved (see table B1 in appendix B for a description of the career lattice). The program was then discontinued due to lack of state funding.

The incentive program offered $100 on completing 3–9 college quarter credits or 35–90 hours of community-based training (steps 3–6); $150 on completion of the CDA credential, 12–40 quarter credits, or 120–400 hours of community-based training (steps 7–8.5); and $200 on earning an associate or bachelor's degree or completing 600–800 hours of community-based training (steps 9–10). All incentives were paid after OCCD verified step completion (for example, after degree receipt) and professional development attainment. Once participants received the incentive for a given group of steps, no additional incentives were provided for movement between steps within a group. For example, if participants entered the career lattice with the CDA credential, they would be assigned to step 7 and, until April 2020, could have received a $150 incentive payment; if they entered with 300 community-based training hours, they would be assigned to step 8 and, until April 2020, also could have received a $150 incentive payment. If participants were at step 7, had already received the $150 incentive, and moved to step 7.5, they would not have received an additional incentive. The incentives were not designed to compensate directly for hours of time spent gaining education, and the amount of incentive per hour of education time decreased as the lattice steps increased. For someone who reached step 7 with 120 hours of community-based training, the $150 incentive translated to $1.25 per hour spent in training, or about 12 percent of the median hourly wage of $10.72 for ECE workforce members not in a preschool setting (U.S. Department of Labor, 2017b).

After entering the lattice (and, until April 2020, potentially receiving an incentive commensurate with their step), participants can continue with their education through additional college credits or community-based training hours (typically continuing in the same pathway through which they achieved their current step). According to OCCD staff members, Oregon Registry Online registrants with a career lattice step often reach the step for the CDA credential or associate degree and then do not continue to advance in the career lattice.

In addition to these monetary incentives for reaching certain steps in the career lattice, OCCD administers a scholarship program that pays community college tuition for up to four credits per term (up to approximately $450 per term based on 2017/18 tuition rates) for individuals working more than 20 hours a week at a licensed care facility. All Oregon Registry Online registrants in the career lattice could apply for the scholarship and submit their course registration for reimbursement. Historically, according to OCCD, scholarship uptake has been low.

However, only about a third of licensed child care workers sign up to have their experience and education translated into a step in the career lattice. Two-thirds of the licensed care workforce in Oregon do not sign up for the career lattice despite the monetary incentives. Those who do not sign up might be engaging in professional development beyond licensure requirements but not reporting it to OCCD, or they might not be engaging in professional development. OCCD and the Oregon Department of Education Early Learning Division want to encourage participation in the career lattice by providing clear pathways to advancement and to help the state understand the education levels of the early childhood workforce, which could in turn guide state policy in this area.

This study examined ways to provide incentives to and encourage participation in the career lattice and increase education levels for those in the career lattice. In addition, because many workforce members stall between steps 7 and 9 and OCCD is interested in encouraging continued professional development—particularly for workforce members with less than an associate degree—the study focused on a narrow band of the lattice, where financial incentives might be expected to have a larger impact. This also allowed the study to redistribute the existing amount of financial incentive dollars without adding to the cost of the program to the state.

Related literature on study intervention

The study team reviewed literature on the implementation and effectiveness of information campaigns and financial incentives aimed at increasing continuing education among target populations relevant to the current study (for example, students or adults from low-income households or other underrepresented groups, or ECE professionals). This research base informed the study's hypotheses that these types of interventions can improve professional development outcomes among ECE professionals.

While a limited number of studies speak specifically to this study's hypotheses, the reviewed literature suggests the potential for considering both information interventions and financial incentives as a part of the professional development system. The limited existing research base also highlights the need for more rigorous research.

Information interventions using behavioral nudges. Over the last several years the policy community, including education practitioners and researchers, has adopted behavioral economics strategies—specifically, the use of behavioral nudges—in large-scale social interventions and experiments (Chetty, 2015; Thaler & Sunstein, 2008). A behavioral nudge changes the presentation of choices in such a way that people are more likely to choose one option than another. The most common behavioral nudges in education experiments are tailored and timely information interventions (in the form of mailings, emails, and text messages) aimed at changing an individual's behavior in socially optimal ways (National Science and Technology Council, 2015).

A growing body of literature, focused primarily on postsecondary education access and persistence, provides evidence that some information campaigns and information coupled with other supports might be effective at encouraging students from low-income backgrounds to apply for need-based aid and to enroll and persist in college. Bettinger et al. (2012) found that low-income families who received both an information intervention related to college access (a financial aid estimate anchored to tuition costs at nearby institutions) and assistance in completing federal financial aid forms were more likely to submit the Free Application for Federal Student Aid (FAFSA). The combination of intervention and assistance also increased college enrollment, persistence, and receipt of aid. Importantly, individuals who received only the information intervention (without additional tailored assistance) did not experience any positive effects on postsecondary outcomes.

However, in other contexts information-only interventions have been found to positively influence postsecondary outcomes. For example, Castleman and Page (2015) found that text message interventions targeted at college-intending high school graduates and their parents significantly increased students' likelihood of enrolling in college. Similarly, Hoxby and Turner (2013) found that providing tailored information to high-achieving students from low-income households during the college application process encouraged students to apply to and enroll in colleges better matched to their academic abilities. Several additional studies have also found positive effects of information-only interventions on college enrollment (Barr & Turner, 2018; Castleman & Page, 2017; Hyman, 2020; Page & Gehlbach, 2017), submission of financial aid application (ideas42, 2015; Page et al., 2020), and college persistence (Castleman & Meyer, 2016; Castleman & Page, 2016).

While the literature to date on the efficacy of behavioral nudge interventions in education has been largely positive, a series of recent studies examining the effect of nudge interventions that were scaled up to either the state or national level have found no effects on targeted populations (prior interventions were targeted to

students graduating from some partner school districts or charter networks or subsets of national or state populations—for example, high-achieving low-income students). In what the authors described as "the largest FAFSA nudge campaign to date," Bird et al. (2019, p. 3) found no effects of FAFSA informational nudges on financial aid receipt or college enrollment across any groups in a study of about 800,000 students across the nation and within one large state. Their study included several experimental conditions, and except for one treatment arm, all treatments were information-only nudges that varied by timing, delivery method, content framing, and design. This result aligns with other recent studies examining informational nudges administered through a statewide or national partner. These studies have found no impacts on college enrollment or persistence (Bergman et al., 2019; Gurantz et al., 2019) and no effects on financial aid application submissions (Goldrick-Rab et al., 2019).

Characteristics of effective information campaigns. The literature on characteristics of effective information campaigns is mixed. Hoxby and Turner's (2013) early nudge study found that families had a strong preference for paper materials rather than information shared via email. In addition, given participants' general suspicion about these interventions due to concerns of falling victim to scams, families were more responsive when information was accompanied with fee waivers. However, the pilot study from which these findings are drawn took place in 2009 and 2010, and thus the results might not generalize to today given how quickly preferences and norms around technology use can change. Bird et al.'s (2019) recent study of scaling up nudge interventions tested a number of variations in the framing of the message content, delivery method (postal mail, emails, and text messages), and timing for FAFSA information nudges and found no impacts on financial aid receipt or college enrollment for any of the treatment arms.

Additional literature in behavioral economics provides other examples of the effectiveness of different intervention characteristics. For instance, the most effective emails to increase a desired behavior (for example, enrollment in savings plans) include a simplified, streamlined message; provide a clear outline of the action steps or behaviors required; and emphasize the long-term benefits of the action (for example, saving money; National Science and Technology Council, 2015). Other research highlights the importance of providing personalized information to study participants. For example, a study examining the effectiveness of information interventions targeted toward parents of school-age children found that personalized text messages (for example, including student-specific information with actions or suggestions tailored to a student's skill level) were more effective than generic information-only nudges (Doss et al., 2019). Similarly, research on the role of text messages in increasing loan repayment found that including the loan officer's name improved repayment (Karlan et al., 2012). Further, when sending nudges to work email addresses, emails scheduled to be received at lunchtime might maximize open rates (National Science and Technology Council, 2015).

Finally, findings on the use of loss-framed versus gain-framed content in behavioral nudges are mixed. Loss-framed content focuses on what an individual might lose by not taking up the treatment, while gain-framed content focuses on what an individual might gain by taking up the treatment (National Science and Technology Council, 2015). The National Science and Technology Council (2015) found that loss-framed emails were more effective than gain-framed emails. Yet, Karlan et al. (2012) found no differences in loss versus gain framings in text messages.

Financial incentives in the early childhood education context. The empirical evidence on the effectiveness of financial supports to encourage ECE workforce members to continue their education or participate in professional development activities has grown over the last two decades but remains sparse. Three literature reviews on the extant research suggest that state programs that include financial supports aimed at increasing ECE workforce members' education levels or participation in professional development activities might have been effective in achieving those outcomes (Park-Jadotte et al., 2002; Weber & Trauten, 2008; Whitebook & Bellm, 2004). However, this literature is largely descriptive and, in many cases, does not employ a comparison group. Moreover, the size of the financial incentive offered varied widely across programs. The study team could not locate any

experimental evidence on the impact of financial supports on ECE workforce members' educational attainment or professional development outcomes or a clear consensus as to the size of the incentive needed to influence behavior.

Park-Jadotte et al. (2002) concluded that state programs that provided direct financial support or incentives for increased education or training, such as bonuses or salary supplements using a variety of compensation strategies (stipends, wage ladders, scholarships, and wage supplements), were associated with higher worker education levels. Only one evaluation included in the review employed a comparison group (without randomization), while the other studies used designs that compared participants pre- and post-intervention. The size of the financial incentives in the seven programs in the literature review varied widely. In one program the maximum award at the lowest tier was $500, with the stipend increasing to $6,000. In another program individuals who obtained the CDA credential were awarded a stipend of $200, moving up to an award of $1,000 for individuals who obtained a bachelor's or master's degree. Another program rewarded participants with either a one-time bonus in the range of $100–$700 or a 4–5 percent pay increase.

In a 2004 review of the evaluations on California's financial support initiatives for the child care workforce, the Compensation and Recognition Encourage Stability (CARES) program, Whitebook and Bellm (2004) concluded that participants in programs that tied financial incentives (in this case, stipends) to professional development often exceeded required education and training levels and exhibited strong involvement in professional development. Again, the evaluations included in this review did not rely on methods that support causal interpretations of the findings; only two of the evaluations included a comparison group (without randomization), and others relied largely on designs that compared participants' pre- and post-program participation. The financial incentives in the programs studied ranged from $80 to $200 at the entry level and from $2,000 to $6,000 per year at the top of the education ladder (Whitebook & Bellm, 2004).

Similarly, Weber and Trauten (2008) found that programs tied to compensation initiatives (including scholarships, stipends, and annual bonuses) have been associated with advancement on participants' state career ladders and completion of various credentials or other degree programs. Although, as the authors noted, most of these studies were correlational and did not support causal conclusions. The studies included in the Weber and Trauten (2008, p. 24) review used stipends that ranged from "$100 for the lowest level in the state with the lowest enhancements to $5,100 for the highest level in the state with the highest enhancements;" the median lowest stipend was $300, and the median highest was $3,000.

More relevant to the current study, a recent study of an Oregon scholarship program to support the professional development of the ECE workforce and the state's education awards program found a positive association between scholarship use and reaching higher steps in the state's career lattice (Weber & Grobe, 2014). The study used statewide administrative data to compare scholarship recipients and nonrecipients among all individuals in the child care workforce, so the findings are not causal. The scholarship program provides "financial support to reduce barriers to training and education for providers working in home-based childcare, center care, Head Start, and before/after school programs," and the education awards are financial incentives that reward workforce members for education achievements tied directly to their progression along the state's career lattice (Weber & Grobe, 2014, p. i). Scholarship award amounts vary from $100 to $2,400, depending on the type of scholarship the individual applies for (Weber et al., 2013). The education awards range from $100 to $500. Additional findings from Weber and Grobe (2014) suggest that participants who received more than one scholarship participated in more training hours, and among participants who received a scholarship, receiving more education awards was associated with higher lattice steps.

Other evidence also supports the link between financial incentives and career progression among ECE professionals. For example, a 2003 study on a scholarship program in Wisconsin found that teachers completed,

on average, 10 credits more than they were otherwise required to complete, while assistant teachers and other ECE professionals completed, on average, 13 more credits than they were otherwise required to in the absence of program participation. That report presents descriptive analyses of scholarship recipients' education and income trajectories (and statewide benchmark figures when available), so findings are descriptive rather than causal. The scholarships in the Wisconsin study were awarded as bonuses that ranged from $200 to $750, and some participants who worked in ECE centers received either bonuses ranging from $150 to $350 from their center or a raise of 1–2.5 percent (Adams et al., 2003).

A 2008 survey of participants in the California CARES program concluded that financial provisions "including stipends, gift cards, and educational or safety supplies" provided by the program were more influential in participants' decisions to participate than other support services offered, such as professional development activities, trainings, and academic counseling (Harder+Company, 2008, p. 14). The program also increased participants' reported desire to remain in the ECE workforce and supported participants' career advancement to a moderate degree (Harder+Company, 2008).

Another evaluation found that a Bay Area ECE retention incentive program increased the number of ECE college courses and trainings in which staff members participated (Bridges & Carlat, 2003). That report compared outcomes between ECE program staff members in counties with incentive programs and ECE program staff members in a comparison county and as such suffers from selection bias. The awards in the Bay Area initiative ranged from $475 to $5,100 and were awarded based on tenure and education level (Bridges & Carlat, 2003).

Qualitative evidence from recent evaluations of statewide programs in California and North Carolina provide further support for the hypothesis that financial incentives are an important strategy to support the continued professionalization of the ECE workforce. In California an evaluation of the statewide quality rating and improvement system found that a majority of surveyed staff members who had participated in quality improvement efforts (such as professional development) reported that the availability of financial supports were at least somewhat important to their decision to participate (Quick et al., 2016). Meanwhile, a 2013 study of North Carolina's compensation program reported that more than 80 percent of those who participated in the scholarship program said it "ease[d] the financial burden of education costs" (Child Care Services Association, 2013, as cited in National Research Council, 2015, p. 468).

Relatedly, a study from the behavioral economics literature provides insight on the relationship among financial incentives, the behavioral framing of those incentives, and desired outcomes. Specifically, Fryer et al. (2012) found that pay-for-performance incentives offered to K–8 teachers in a participating district and framed as "losses" (where teachers were paid a bonus at the beginning of the academic year and told they would have to return some portion if their students did not meet academic performance targets) improved teacher performance relative to bonuses framed as "gains" (where bonuses were paid at the end of the school year if students achieved some level of successes) and to teachers who received no financial incentive.

Given the low average wages in the ECE workforce, a related body of literature on the role of financial incentives in supporting low-income adults in community college provides additional relevant insights. Several studies have found an association between providing financial incentives (for example, performance-based scholarships or more comprehensive supports that include financial incentives) and higher community college enrollment and earned credits among low-income students (Cha & Patel, 2010; Richburg-Hayes et al., 2009; Scrivener & Weiss, 2009). The dollar amounts of the incentives varied across studies, but the evidence suggests that providing financial supports can encourage college-going among low-income populations. Studies with higher dollar amounts for incentives would not have been scalable to the state level in Oregon given existing budget allotments for the incentive program.

Effectiveness of career pathways in increasing educational attainment. Two evaluations of career pathway programs aimed at increasing the educational attainment of adults and young adults found positive effects of participation on program completion, GED passing rates, and postprogram enrollment in postsecondary education (Martin & Broadus, 2013; Miller et al., 2016). Additional research on career pathways for high school students suggests positive effects on educational progression and attainment.

A series of studies on California's Linked Learning initiative, which featured standalone small schools or academies within larger high schools in public school districts in California, showed that students participating in Linked Learning were more likely to graduate from high school; less likely to drop out; and earned, on average, more credits (Warner et al., 2016). The program also had a positive long-term effect on college enrollment among students who entered high school with low academic achievement, as well as a positive effect on four-year college enrollment for Black students (Caspary & Warner, 2017). Additional studies of career pathways for high school students have found positive effects on credit accumulation and progression toward graduation (Castellano et al., 2011) and on high school graduation and attainment of postsecondary credentials (Berger et al., 2013).

Effectiveness of career ladders in other settings. A descriptive study on health training pathways in California's community colleges found that most students that start a health CTE program obtain an award or credential; however, the vast majority of students earn only one award (Bohn et al., 2016). A separate study evaluating the labor market returns of participation in California's community college career pathways found average returns to career and technical education certificates and degrees ranging from 12 percent to 23 percent, with the largest returns for programs in the healthcare sector (Stevens et al., 2018).

In a series of studies on nine career pathways being evaluated under the Pathways for Advancing Careers and Education study sponsored by the Administration for Children and Families, several impact evaluations have found that program participation increases postsecondary enrollment, credit accumulation, and attainment of college credentials (Farrell & Martinson, 2017; Gardiner et al., 2017; Rolston et al., 2017). Two of the three programs evaluated were focused on pathways to health services careers, and one provided general career pathways support toward high-demand occupations, of which nursing and health professions were the most common.

In sum, extant literature demonstrates a range of financial incentive amounts at different points in time or for different education levels and provides evidence that even small financial incentives might help motivate the ECE workforce to engage in professional development. Furthermore, financial incentives are often studied in combination with other program supports, so the isolated impact of the financial incentive is understudied. Behavioral nudges have been shown to work in some other contexts, and the study team hypothesized that they might have an impact in this setting (and tested this hypothesis with this study). In addition, nudges are cost effective and might be easier to implement across larger populations.

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Appendix B. Methods

This appendix provides details on the study data, interventions, key variables and outcome measures, sample, methodology, and protocols.

Data

This study relied on Oregon Center for Career Development in Childhood Care and Education (OCCD) administrative data from the Oregon Registry Online, survey data collected by OCCD, the treatment indicators generated from each randomization, and OCCD staff interviews. Each of these data sources is described in more detail below.

Administrative data from the Oregon Center for Career Development in Childhood Care and Education. The Regional Educational Laboratory (REL) Northwest entered into a data-sharing agreement with OCCD to access information from the Oregon Registry Online on early childhood education (ECE) workforce members. All workforce members in licensed ECE facilities[1] in Oregon must participate in the Oregon Registry Online, which documents the licenses and professional development of ECE professionals in the state. For workforce members who participate in the career lattice, information is available on education background and credits earned, career lattice step, incentives earned or received, work experience, and demographics (race/ethnicity, primary language, and birthdate). For workforce members who do not participate in the state's career lattice, information is available on workplace name, workplace address, and license status.

The study team obtained point-in-time data in summer 2018 to randomly assign Oregon Registry Online registrants and career lattice participants to treatment and control groups. Administrative data from September 2018 (first month of the intervention) and December 2019 (three months after the last nudge) were used for demographic information, workplace characteristics, and outcomes in the analysis. Outcome data, such as career award and scholarship take-up data, collected through December 2019 were included to account for any delays in filing paperwork to enroll in education by early fall 2019. The Oregon Registry Online data are continually updated, with workforce members and OCCD staff entering and updating information as it is received. The data also include historical workforce information, with start and end dates of positions for workforce members. This data source was used to answer research questions 1, 2, and 3 (including subquestions).

Additionally, the study team obtained OCCD email distribution data provided via its email platform, Emma. These data included information for each treatment group for each of the five mailings (September 2018–July 2019) about the number of emails sent and received, opened emails, links clicked within emails, and recipient opt-out of further emails. This data source was used to answer research question 4a, as well as the treatment-on-the-treated analyses for research questions 1, 2, and 3.

Survey data collected by OCCD. OCCD conducted a survey from July 20 to August 21, 2018, to gather baseline data and enroll study participants for both randomizations. OCCD also administered a follow-up survey from September 5 to October 28, 2019, that included many of the same questions as the baseline survey to compare responses across time. However, the follow-up survey also included questions regarding receipt of behavioral nudge and incentive and scholarship information, as well as professional development attainment for participants in the incentive randomization. The REL Northwest advised on survey content and ensured that appropriate consent processes were followed. All OCCD protocols were approved by the Education Northwest Institutional Review Board (IRB) to ensure protection of human subjects. There was a separate survey for each randomization

[1] In addition to ECE services for children up to age 5, licensed ECE facilities may provide care and education services for children up to age 12, referred to as school-age care.

and for baseline and follow-up; all surveys were available in English and Spanish (see protocols at the end of this appendix).

Key measures for the surveys of participants in both randomizations were demographic characteristics, workforce participation, and identification as an ECE professional. For the incentive randomization, additional key measures included reported motivation to take a college course and perspectives on the information received through the behavioral nudge. Additional key outcomes for the incentive randomization surveys included reported enrollment in a college course and the number of college courses enrolled in. This data source was used to answer research questions 1b, 2b, 3b, and 4b.

Treatment indicators. These variables, created by the study team as part of the randomization process (see the next section for more details), indicated whether the ECE professional was assigned to a control group or one of the treatment groups and to which treatment condition the ECE professional was randomly assigned. This data source was used to answer research questions 1, 2, 3, and 4. The sample was all available data from randomization.

Interviews with OCCD staff. The study team conducted semi-structured interviews with key OCCD staff members in April 2020 to gather information about how the treatment was implemented. Interview data were used to answer research question 4. The protocol is included at the end of this appendix and was submitted to Education Northwest's IRB for review and approval.

Interventions

The study consisted of two randomized controlled trials (RCTs)—a sign-up randomization and an incentive randomization—examining registration for the career lattice (sign-up randomization) and movement up the career lattice (incentive randomization). This section describes the three interventions provided to the treatment groups in the two RCTs.

Sign-up randomization. To be in the career lattice, participants needed to sign up to have their education background evaluated by OCCD. According to OCCD, about two-thirds of the ECE workforce had not signed up for the career lattice as of July 2018. ECE workforce members could learn about the incentive for registering for the career lattice from OCCD via several means, including the OCCD website, information distributed at trainings, and through their workplace.

The first RCT (the sign-up randomization) examined how a behavioral nudge (an email inviting and encouraging career lattice participation) influenced sign-up for the career lattice. OCCD and the Oregon Department of Education Early Learning Division wanted to encourage career lattice participation to help the state track the ECE workforce's education levels, to guide policy in this area, and to connect the workforce to pathways that encourage additional education and training. The sign-up randomization consisted of ECE workforce members who were registered in the Oregon Registry Online but not in the career lattice.

OCCD recruited participants through a survey sent out on July 20, 2018, to all eligible workforce members (10,716 individuals in total). Based on survey responses, the study team randomized participants into a control or a treatment group assignment:

- Control (business as usual): ECE staff members working in licensed ECE settings and registered in the Oregon Registry Online (that is, all staff in licensed care settings) did not receive any emails from OCCD encouraging them to sign up for the career lattice. These individuals had not signed up for the career lattice as of the time of randomization.
- Treatment: ECE staff members in licensed ECE settings and registered in the Oregon Registry Online (that is, all staff in licensed care settings) received email nudges from OCCD encouraging them to sign up for the career lattice. The emails also mentioned the existing monetary incentives for reaching certain steps in the career

lattice. After randomization of eligible participants who took the initial survey, the treatment group received the first email nudge on October 12, 2018, and reminder nudges on December 14, 2018, and February 15, May 9, and July 26, 2019 (see figure B1 for an image of the initial nudge). These individuals had not signed up for the career lattice as of the time of randomization.

Both treatment and control groups were invited to complete a follow-up survey on September 5, 2019.

Figure B1. Sign-up randomization email

Dear Ashley Pierson,

Join the Oregon Registry Steps program to be recognized as an early childhood education professional and advance your career!

The Oregon Registry Steps are a sequence of twelve steps based on training and education in the childhood care and education field. The Oregon Registry Steps:

- Recognize your training and education related to childhood care and education.
- Provide a pathway for your future professional development.
- Open doors to money related to your Registry Step (Education Awards, Enhanced Rate, & Scholarships).
- Connect you to others who care about Oregon's children and families.

Your education and training may also qualify for an education award of $100, $150, or even $200!

Sign up today at Oregon Registry Steps!

Sincerely,

Sarah Myers, Oregon Registry Coordinator
Oregon Center for Career Development
503-725-5834

Note: This image is of the first nudge, sent to the treatment group on October 12, 2018.
Source: Oregon Center for Career Development in Childhood Care and Education.

Incentive randomization. The second RCT (the incentive randomization) involved ECE professionals who had already signed up for the career lattice and had an assigned step as of the time of randomization. Specifically, this analysis tested whether nudges combined with a different monetary incentive or with automatic scholarship enrollment encouraged movement in the career lattice and increased continuing education and professional development. To move up a step in the career lattice, workforce members need to submit paperwork to OCCD documenting their professional development hours or college coursework. Workforce members might have engaged in professional development or taken college courses but failed to submit their paperwork to OCCD and thus their step in the lattice might not reflect their true education or training level. To receive the monetary incentive for reaching certain steps, workforce members also need to fill out an application for the incentive and submit a W-9 form for the payment.

OCCD recruited participants through a survey sent out on July 20, 2018, to all eligible ECE workforce members. After randomization of eligible participants who took the survey, treatment group members received their first nudge on August 31, 2018, and reminder nudges on November 16, 2018, and February 15, May 9, and July 26, 2019 (see figure B2 for an image of the initial nudges for both arms). Both treatment and control groups were invited to complete a follow-up survey on September 5, 2019.

The treatment and control groups for the incentive randomization are described below. Eligible participants in each group were those who signed up for the study; were in step 7, 7.5, or 8 of the career lattice at the beginning of the study period (all pre-associate degree); and who had already received the $150 incentive for reaching steps 7–8.5. The study team randomly assigned eligible participants into one of three groups:

- Control (business as usual):
    - These participants did not receive an email from OCCD with information on incentives, scholarships, or encouragement to take courses or professional development hours.
    - These participants were eligible for the business-as-usual OCCD incentive scheme in place until April 2020 (see table B1) in which payments were provided on completion of a credential, certificate, degree, or certain number of professional development hours at specific career lattice steps (incentives provided under the current scheme at the first step reached within steps 3–6, steps 7–8.5, and steps 9–10). To receive this payment, workforce members needed to fill out an application for the payment and submit documentation of the professional development or coursework.
    - These participants could choose to sign up for the business-as-usual scholarship program but were not encouraged to do so. If they chose to sign up, they needed to apply and be approved prior to accessing scholarship funds.
- Treatment 1—monetary incentive:
    - These participants received emails from OCCD with information on incentives and encouragement to take courses or professional development hours.
    - These participants were eligible for a modified OCCD incentive scheme that rewarded movement toward an associate degree. The treatment offered an additional $100 incentive at each of steps 7.5, 8, and 8.5, up to a total of $200 to encourage continued movement in the lattice (no additional amount would be disbursed at step 9; see table B1). Movement of one step (for example, step 7 to 7.5) would result in a $100 incentive payment, while movement of two steps (for example, step 7 to 8, step 7.5 to 8.5, or step 8 to 9) would result in a payment of $200. These monetary amounts represented a redistribution of the available funding per person under the business-as-usual award program (that is, $200 on reaching step 9 or 10), meaning that this new incentive scheme could be expanded statewide without increasing the cost to the state if it proved successful. This group was eligible for the new incentive scheme only and not

for the business-as-usual scheme. To receive the payment, the workforce member needed to fill out an application for the payment and submit documentation of the professional development or coursework.

  - These participants could sign up for the business-as-usual scholarship program but were not encouraged to do so. If they signed up, they needed to apply and be approved prior to accessing scholarship funds.

- Treatment 2—automatic scholarship enrollment:
  - These participants received emails from OCCD with information that they had been enrolled in a scholarship program and could be reimbursed for community college tuition. The emails included information about college term registration dates and support available from OCCD to help them decide what classes to take. They did not receive information on incentives tied to the career lattice or encouragement to pursue professional development.
  - These participants were eligible for the business-as-usual incentive scheme.
  - These participants were automatically enrolled in a scholarship program that pays for up to six credits of community college tuition per term. They did not have to fill out an application and be approved prior to accessing scholarship funds; they needed only to send in their course registration to OCCD. For the July 2019 final reminder email regarding the scholarship enrollment, the email included notice that the number of credits paid for was reduced from six to four for the next term.

Table B1. Career lattice steps and incentives for the early childhood education workforce in Oregon, 2018

Step	Degree, credential, certificate track	College course credit track	Community-based training track	Incentive (available through April 2020)	Monetary incentive treatment
1	Registered with the Office of Child Care, met Department of Human Services enhanced rate requirements, or 12 hours			No incentive	na (treatment incentive program applies only to steps 7.5, 8, and 8.5)
2	Step 1 plus 20 hours			No incentive	
3	3 quarter credits	3 quarter credits or 35 hours	35 hours	$100 upon reaching steps 3–6 (available once for the first eligible step)	
4	5 quarter credits	5 quarter credits or 50 hours	50 hours		
5	7 quarter credits	7 quarter credits or 70 hours	70 hours		
6	9 quarter credits	9 quarter credits or 90 hours	90 hours		
7	Child Development Associate credential	12 quarter credits	120 hours	$150 upon reaching steps 7–8.5 (available once for the first eligible step)	
7.5	Child Development Associate credential plus 8 quarter credits	20 quarter credits	200 hours		$100 upon reaching step 7.5, cumulative maximum at $200
8	Articulated certificate	30 quarter credits	300 hours		$100 upon reaching step 8, cumulative maximum at $200
8.5	Articulated certificate	40 quarter credits	400 hours		$100 upon reaching step 8.5, cumulative maximum at $200
9	Associate degree	60 quarter credits	600 hours	$200 upon reaching steps 9–10 (available once for the first eligible step)	No incentive
9.5	Step 9 plus 10 upper-division credits	70 quarter credits	700 hours		
10	Bachelor's degree	80 quarter credits	800 hours		
11	Master's degree	na	na	No incentive	
12	Doctorate degree	na	na	No incentive	

na is not applicable.
Note: Steps indicate cumulative credits or hours. One quarter credit is equivalent to 30–36 hours of time (Portland Community College, 2017). Most steps specify that credits and hours be in specific core knowledge categories or that degrees be in certain content areas. Refer to Oregon Center for Career Development in Childhood Care and Education (2018) for details. Community-based training refers to professional development offered by OCCD partners and trainers. The incentive program was available to workforce members who applied for awards based on their step level through April 2020.
Source: Authors' compilation based on information from the OCCD.

Figure B2. Incentive randomization email

Panel A. Monetary incentive

Dear Ashley Pierson,

Due to your participation in the Oregon Registry Steps, you may be eligible* for a special education award program where you can earn $100 by moving up to your next step on the Oregon Registry Steps! Consider registering for a college course or community training event this fall to help you reach your next step. View the Oregon Registry Online Training Calendar to see upcoming training events and dates or Oregon Registry and Community Colleges to find Oregon community college early childhood programs.

You could receive $100 for each new step you reach, up to a total of $200. For example, if you are currently at Step 7, you could receive $100 when you reach Step 7.5 and another $100 when you reach Step 8. See the table below to determine your education award eligibility based on step movement.

Starting Step	Next Step / Award	Next Step / Award
7	7.5 / $100	8 / $100
7.5	8 / $100	8.5 / $100
8	8.5 / $100	9 / $100

Not sure what you need to get to the next Registry Step? Find more information about Registry Step requirements at Oregon Registry Steps & Education Awards guide prepared exclusively for you. Still have questions? Email us at occd-support-group@pdx.edu.

Sincerely,
Sarah Myers, Oregon Registry Coordinator
Oregon Center for Career Development

* To be eligible, you must be currently working at an Oregon Office of Child Care licensed facility. This special education award program is available until February 2020. Education awards will be available for as long as funding allows. The awards are processed in the order of the date received by OCCD. Processing may take up to 45 business days.

Panel B. Automatic scholarship enrollment

Dear Ashley Pierson,

Congratulations! You have been enrolled in the Betty Gray Early Childhood Scholarship Program through your participation in the Oregon Registry. OCCD is automatically enrolling a select group of ECE professionals as part of our professional development efforts. This scholarship supports the growth of quality child care in Oregon by providing financial support for training and education for childhood care and education professionals.

Your program enrollment is specifically for Oregon community college tuition. The scholarship will pay for up to **6 credits per term** of Oregon community college tuition for classes in the field of early childhood education.

To receive your scholarship, simply register for class and send our office a copy of your proof of registration by September 17 (for PCC the date is September 7). You may attach a copy of your class schedule in a reply to this email or mail it to PSU-OCCD, ATTN: Scholarship, PO Box 751, Portland OR 97207. If we receive your proof of registration by the deadline, we will pay your college directly for up to six credits of tuition (please make sure you arrange payment for any additional fees on your student account). Visit Oregon Registry and Community Colleges to find an eligible Oregon community college.

Registration is now open for fall courses, and classes begin on Monday, September 24th. If you will need more time to plan for coursework, your scholarship is effective through Winter term 2020, as long as you are working in an Oregon Office of Child Care licensed facility and scholarship funds are available.We can help you understand what courses to take to advance your career. Email us at occd-support-group@pdx.edu with your questions. See additional scholarship details at the Questions & Answers prepared exclusively for you, including information about other professional development scholarship opportunities you may be interested in.

Sincerely,
Sarah Myers, Oregon Registry Coordinator
Oregon Center for Career Development

Note: These images are of the first nudge, sent to the treatment groups on August 31, 2018.
Source: Oregon Center for Career Development in Childhood Care and Education.

Key variables and outcome measures

This section describes the key variables and outcome measures used in the study. Several control variables were used in regression analyses as covariates for a sensitivity analysis (table B2).

Table B2. Control variables used in regression analyses

Covariate	Sign-up randomization	Incentive randomization—monetary incentive	Incentive randomization—automatic scholarship enrollment	Data source
Three indicators for baseline highest degree (some college, associate degree, bachelor's degree or higher). High school or less is the reference category.	✔	✔	✔	Baseline survey; Oregon Registry Online administrative data
Two indicators for race/ethnicity (Latinx, or other educator of color). White is the reference category.	✔	✔	✔	Baseline survey; Oregon Registry Online administrative data
Indicator measured at baseline for whether a participant plans to continue working in the field for more than five years.	✔	✔	✔	Baseline survey
Three indicators for the age groups served by the program the participant reported working for at baseline (infant or toddler [only for sign-up], preschool, or school age).	✔	✔	✔	Baseline survey
Three indicators for the type of program a participant reported working for at baseline (child care center, home-based care, or Head Start [only for sign-up]).	✔	✔	✔	Baseline survey
Indicator measured at baseline for whether a participant planned to continue formal education.	✔	✔	✔	Baseline survey
Indicator measured at baseline for whether a participant planned to participate in future professional development opportunities.	✔			Baseline survey
Indicator measured at baseline for whether an individual had the Child Development Associate credential.	✔			Baseline survey
Indicator measured at baseline for an individual's identification as a professional.	✔			Baseline survey
Indicator measured at baseline for an individual's motivation	✔			Baseline survey
Two indicators for baseline step (step 7 and step 8).		✔	✔	Oregon Registry Online administrative data
Two indicators for most recent step path an individual took (college course credit and community-based training).		✔	✔	Oregon Registry Online administrative data
Number of years working in the field at baseline.		✔	✔	Baseline survey
Indicator for whether an individual expects a raise with a higher degree measured at baseline.		✔	✔	Baseline survey
Indicator for whether an individual was enrolled in a college course at baseline.		✔	✔	Baseline survey
Indicator for whether an individual reported that the workplace was very supporting of participating in ongoing professional development at baseline.		✔	✔	Baseline survey

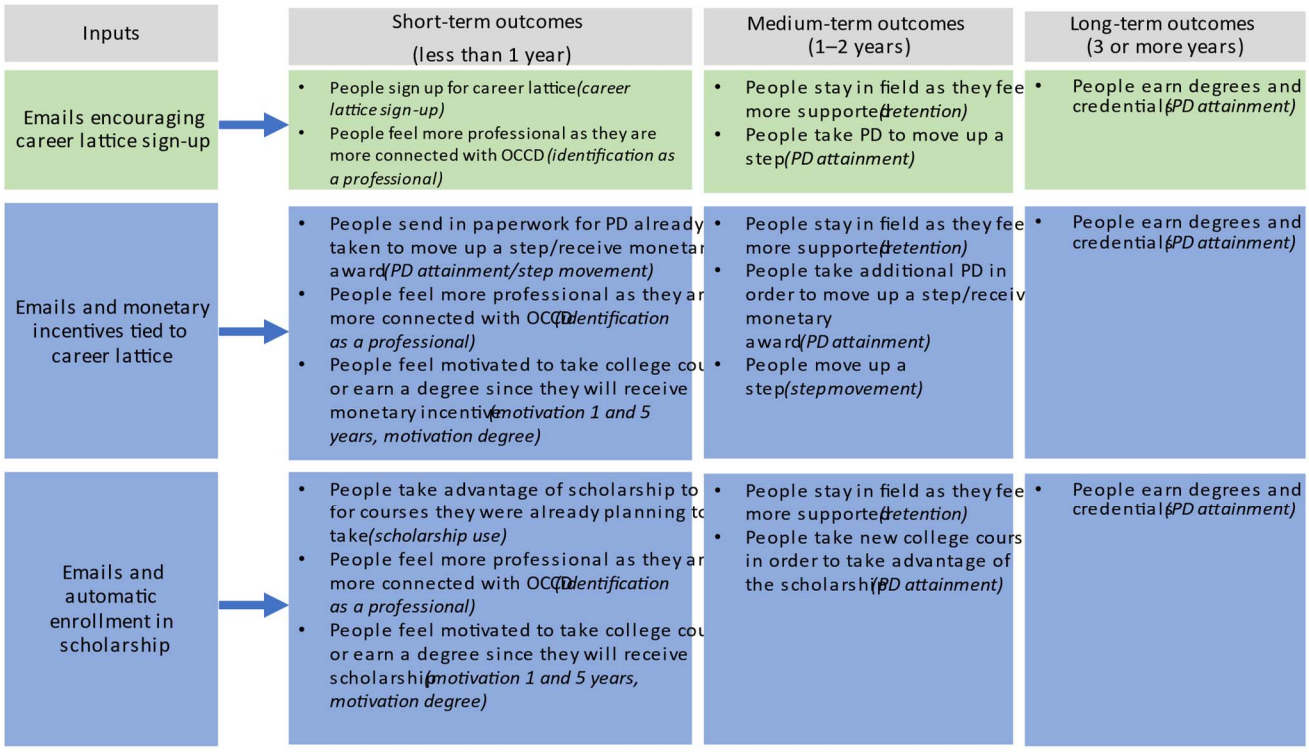
Source: Authors' compilation.

The study team determined outcome measures based on a logic model of the study interventions and what they might be expected to influence in the short, medium, and long term (figure B3). For research question 1 (sign-up randomization), the study team constructed an indicator variable for whether an individual enrolled in the career lattice as of January 1, 2020, and used an indicator of whether an individual was retained at the same workplace during the study period. For research questions 2 and 3 (incentive randomization), the outcome measures included an indicator for whether an individual increased a step during the study period, total number of community-based training hours recorded, total number of college credit hours earned, and an indicator for whether an individual received a scholarship during the study period (for the automatic scholarship enrollment group of the incentive randomization only), as well as the indicator of whether the individual was retained at the same workplace during the study period.

The study team also examined additional secondary outcomes that were used in exploratory analysis (questions 1b, 2b, and 3b) because they are not the main outcomes of interest and they draw from survey data that experienced significant attrition. These outcomes included a dichotomous variable denoting an increase in identification as an early learning professional at the follow-up survey compared with the baseline survey. For example, respondents who responded "somewhat agree" at baseline and "strongly agree" at follow-up when asked to what extent they agreed with the statement "I feel like I am an early learning professional" were denoted as having an increase. The variable for increase in identification as a professional came from item 20 in the baseline survey and item 5 in the follow-up survey (sign-up randomization) and item 14 in the baseline survey and item 3 in the follow-up survey (incentive randomization). The question was on a 5-point scale from strongly disagree to strongly agree, and any increase from strongly disagree to disagree, from disagree to neither agree nor disagree, from neither agree nor disagree to agree, or from agree to strongly agree (or increases of more than one level) was coded as an increase. Identification as a professional is a key concept in the ECE workforce; increasing workforce members' sense of identification as a professional could contribute to increases in the quality of care they provide (National Research Council, 2015). Other aspects of professionalism, such as earning appropriate compensation, are not captured in this study's measure.

Other secondary outcomes included motivation to take college courses in the next year or the next five years and motivation to earn a degree in five years. These variables were constructed from the follow-up survey questions and indicate whether respondents' level of motivation to take a college course in the next year, take a college course in the next five years, or earn a degree was high or very high. These motivation indicators were taken from items 4, 5, and 6 in the follow-up survey (used in incentive randomization only). The study team and the OCCD partners selected these motivation outcomes as potential leading indicators of behavior change (enrolling in and completing professional development; see figure B3).

Figure B3. Logic model of study interventions



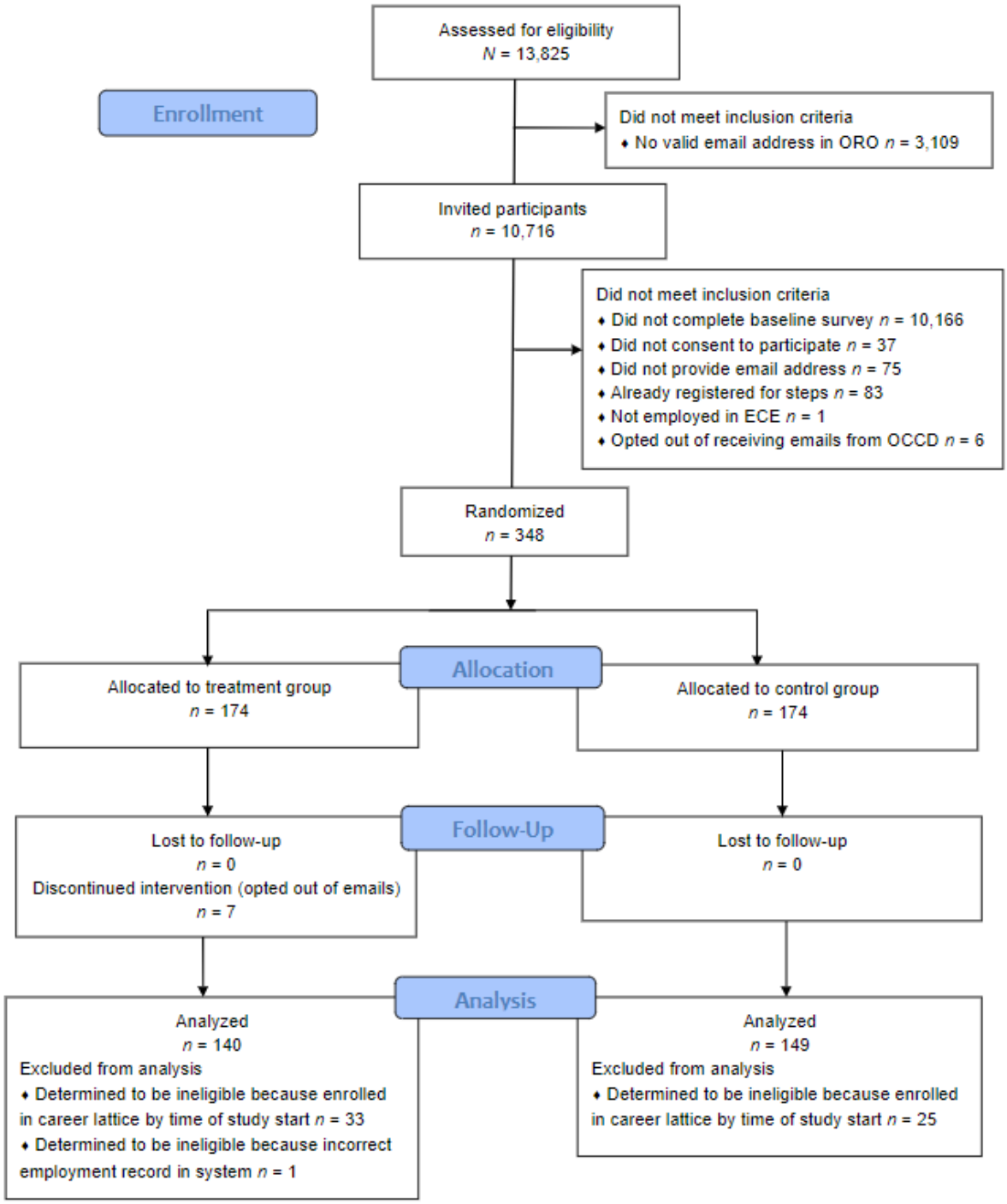
OCCD is Oregon Center for Career Development in Childhood Care and Education. PD is professional development (encompassing college coursework and training hours).
Source: Authors' compilation.

Sample

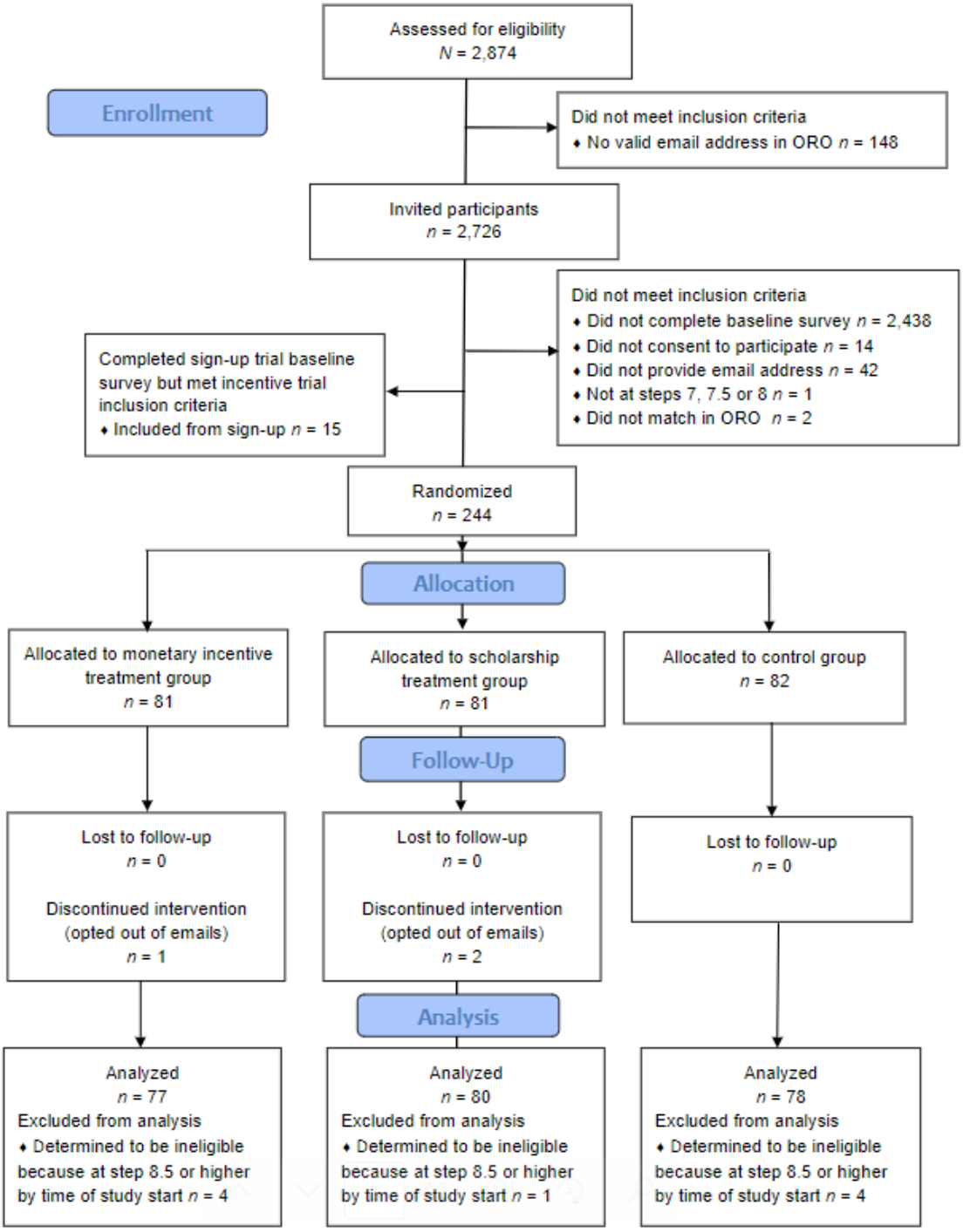
This section details the study sample. For the sign-up randomization, OCCD invited all Oregon ECE workforce members who were not in the career lattice at the time of randomization to participate (see panel A in figure B4 for a diagram of eligibility and participation). For the incentive randomization (both the monetary incentive and the automatic scholarship enrollment treatment groups), OCCD invited all Oregon ECE workforce members who were in the career lattice and were at career step 7, 7.5, or 8 to participate (see panel B in figure B4 for a diagram of eligibility and participation). The study team conducted the random assignments in August 2018 for the incentive randomization and in October 2018 for the sign-up randomization, using rerandomization (Mihaly et al., forthcoming; Morgan & Rubin, 2015) to ensure that the treatment and control groups were similar on important covariates. Rerandomization involves conducting repeated randomizations until the difference in characteristics between the two groups is small enough to be acceptable (based on a threshold set before the randomization starts). The process involves randomizing assignments, checking for balance in characteristics, and discarding the assignment until a randomization yields the desired balance. For this study the threshold for an acceptable difference was set so that 5 percent of the random assignments would be acceptable. By ensuring that the two groups are similar, rerandomization provides more precise and trustworthy estimates of treatment effects (Morgan & Rubin, 2015).

Figure B4. Consolidated standards of reporting trials (CONSORT) diagram

Panel A. Sign-up randomization



Panel B. Incentive randomization



ECE is early childhood education. OCCD is Oregon Center for Career Development in Childhood Care and Education. ORO is Oregon Registry Online.
Source: Authors' compilation.

Sample characteristics and power calculations. For the sign-up randomization 10,716 individuals were invited to participate in the study. Of those invited, 348 agreed to participate (see table B3 and table B6 later in the appendix for sample characteristics and outcomes). For the incentive randomization 2,726 individuals were invited to participate in the study. Of those invited, 244 agreed to participate (see tables B4, B5, B7, and B8 for sample characteristics and outcomes). Table B9 compares characteristics of the study sample to the state sample. Table B10 compares characteristics of the study sample for the sign-up and incentive randomizations to those of individuals in the workforce but not in the career lattice and to those of individuals at step 7, 7.5, or 8. Table B11 shows power calculations for these sample sizes.

Table B3. Sign-up randomization: Participant characteristics at time of assignment and end of study period, 2018 and 2019

	At time of assignment				At end of study period					
	Treatment (*n* = 140)		Control (*n* = 149)		Treatment (*n* = 140)		Control (*n* = 149)		Significance	
Participant characteristic	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Female	94.4	89	92.8	97	94.4	89	92.8	97	ns	ns
Gender missing	36.4	140	34.9	149	36.4	140	34.9	149	ns	ns
Race/ethnicity										
White	65.3	124	62.8	129	65.3	124	62.8	129	ns	ns
Latinx	20.2	124	24.8	129	20.2	124	24.8	129	ns	ns
Non-Latinx educator of color	14.5	124	12.4	129	14.5	124	12.4	129	ns	ns
Race/ethnicity missing	11.4	140	13.4	149	11.4	140	13.4	149	ns	ns
Age (years)	37.3	140	35.0	149	38.7	140	36.4	149	ns	ns
Lives in urban area	86.4	140	77.9	149	86.4	140	77.9	149	ns	ns
Lives in rural area	13.6	140	22.1	149	13.6	140	22.1	149	ns	ns
Primary language										
English	83.7	92	85.1	101	83.7	92	85.1	101	ns	ns
Non-English	16.3	92	14.8	101	16.3	92	14.8	101	ns	ns
Primary language missing	34.3	140	32.2	149	34.3	140	32.2	149	ns	ns
Highest level of education (self-reported)										
High school diploma or less	28.4	134	24.6	138	33.0	103	30.3	109	ns	ns
Some college or other professional certificate	22.4	134	25.4	138	15.5	103	15.6	109	ns	ns
Associate degree	10.5	134	11.6	138	13.6	103	15.6	109	ns	ns
Bachelor’s degree or more	38.8	134	38.4	138	37.9	103	38.5	109	ns	ns
Self-reported education missing	4.3	140	7.4	149	26.4	140	26.9	149	ns	ns

Participant characteristic	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 140)		Control (*n* = 149)		Treatment (*n* = 140)		Control (*n* = 149)			
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Job characteristics										
Tenure, overall (years)	6.5	106	4.8	111	na	na	na	na	ns	na
Tenure missing	24.3	140	25.5	149	na	na	na	na	ns	na
Workplace role										
Director/owner	8.5	118	7.3	124	9.3	54	12.7	55	ns	ns
Lead teacher	14.4	118	12.9	124	22.2	54	10.9	55	ns	ns
Teacher	16.1	118	21.0	124	14.8	54	25.5	55	ns	ns
Aide/assistant teacher	44.1	118	48.4	124	27.8	54	30.9	55	ns	ns
Other role	16.9	118	10.5	124	25.9	54	20.0	55	ns	ns
Workplace role missing	15.7	140	16.8	149	61.4	140	63.1	149	ns	ns
Workplace type										
Child care center	53.4	118	53.2	124	na	na	na	na	ns	na
Head Start/Early Head Start	16.9	118	21.0	124	na	na	na	na	ns	na
Home-based care	14.4	118	10.5	124	na	na	na	na	ns	na
Relief nursery, elementary school, or other	15.3	118	15.3	124	na	na	na	na	ns	na
Program type missing	15.7	140	16.8	149	na	na	na	na	ns	na
Rerandomization balance variables										
Plan to continue working in this field for more than five years	53.4	118	56.1	123	na	na	na	na	ns	na
Plan to continue working in this field for more than five years missing	15.7	140	17.5	149	na	na	na	na	ns	na
Ages of children in your program: Infant or toddler	63.6	118	63.4	123	na	na	na	na	ns	na
Ages of children in your program: Preschool	78.8	118	82.1	123	na	na	na	na	ns	na
Ages of children in your program: School-age	44.9	118	39.0	123	na	na	na	na	ns	na

Participant characteristic	At time of assignment: Treatment (*n* = 140) Percent	At time of assignment: Treatment (*n* = 140) Number	At time of assignment: Control (*n* = 149) Percent	At time of assignment: Control (*n* = 149) Number	At end of study period: Treatment (*n* = 140) Percent	At end of study period: Treatment (*n* = 140) Number	At end of study period: Control (*n* = 149) Percent	At end of study period: Control (*n* = 149) Number	Significance: At time of assignment	Significance: At end of study period
Ages of children in your program missing	15.7	140	17.5	149	na	na	na	na	ns	na
Plan to participate in future training	59.2	120	58.4	125	na	na	na	na	ns	na
Plan to participate in future training missing	14.3	140	16.1	149	na	na	na	na	ns	na
Plan to continue formal education	57.5	120	59.7	124	na	na	na	na	ns	na
Plan to continue formal education missing	14.3	140	16.8	149	na	na	na	na	ns	na
Have the CDA credential at baseline	10.4	125	13.1	130	na	na	na	na	ns	na
Have the CDA credential at baseline missing	10.7	140	12.7	149	na	na	na	na	ns	na
Identify as a professional: strongly agree	42.7	117	42.7	124	na	na	na	na	ns	na
Identify as a professional: missing	16.4	140	16.8	149	na	na	na	na	ns	na
What motivates you to continue education: missing at baseline	30.7	140	32.2	149	na	na	na	na	ns	na

CDA is Child Development Associate. na is not applicable. ns is not significant.
Note: No differences between groups for the sign-up randomization were significant at $p < .05$.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Table B4. Incentive randomization: Characteristics of monetary incentive participants at time of assignment and end of study period, 2018 and 2019

	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 77)		Control (*n* = 78)		Treatment (*n* = 77)		Control (*n* = 78)			
Participant characteristic	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Female	97.4	77	96.1	78	97.4	77	96.1	78	ns	ns
Gender missing	0.0	77	0.0	78	0.0	77	0.0	78	ns	ns
Race/ethnicity										
White	61.0	77	68.0	75	61.0	77	68.0	75	ns	ns
Latinx	23.4	77	24.0	75	23.4	77	24.0	75	ns	ns
Non-Latinx educator of color	15.6	77	8.0	75	15.6	77	8.0	75	ns	ns
Race/ethnicity missing	0.0	77	3.8	78	0.0	77	3.8	78	ns	ns
Age (years)	43.5	77	43.8	78	44.8	77	45.1	78	ns	ns
Lives in urban area	71.4	77	76.9	78	71.4	77	76.9	78	ns	ns
Lives in rural area	28.6	77	23.1	78	28.6	77	23.1	78	ns	ns
Primary language										
English	80.5	77	84.6	78	80.5	77	84.6	78	ns	ns
Non-English	19.5	77	15.4	78	19.5	77	15.4	78	ns	ns
Primary language missing	0.0	77	0.0	78	0.0	77	0.0	78	ns	ns
Highest level of education (self-reported)										
High school diploma or less	22.1	77	16.0	75	27.6	76	27.5	69	ns	ns
Some college or other professional certificate	46.8	77	48.0	75	44.7	76	40.6	69	ns	ns
Associate degree	13.0	77	10.7	75	9.2	76	10.1	69	ns	ns
Bachelor's degree or more	18.2	77	25.3	75	18.4	76	21.7	69	ns	ns
Self-reported education missing	0.0	77	3.8	78	1.3	77	11.5	78	*	**

Participant characteristic	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 77)		Control (*n* = 78)		Treatment (*n* = 77)		Control (*n* = 78)			
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Most recent step number										
Step 7	68.8	77	61.5	78	57.1	77	50.0	78	ns	ns
Step 7.5	16.9	77	15.4	78	15.6	77	12.8	78	ns	ns
Step 8	14.3	77	23.1	78	16.9	77	24.4	78	ns	ns
Step 8.5	0.0	77	0.0	78	2.6	77	10.3	78	ns	ns
Step 9	0.0	77	0.0	78	6.5	77	1.3	78	ns	ns
Step 9.5	0.0	77	0.0	78	0.0	77	0.0	78	ns	ns
Step 10	0.0	77	0.0	78	1.3	77	1.3	78	ns	ns
Step 11	0.0	77	0.0	78	0.0	77	0.0	78	ns	ns
Most recent step path										
Degree, certificate, credential	20.8	77	16.7	78	22.1	77	17.9	78	ns	ns
College course credit	39.0	77	50.0	78	35.1	77	47.4	78	ns	ns
Community-based training	26.0	77	17.9	78	22.1	77	17.9	78	ns	ns
Combination	14.3	77	15.4	78	20.8	77	16.7	78	ns	ns
Step 1–6 undifferentiated in data	0.0	77	0.0	78	0.0	77	0.0	78	ns	ns
Job characteristics										
Tenure, overall (years)	11.3	68	12.2	68	na	na	na	na	ns	na
Tenure missing	11.7	77	12.8	78	na	na	na	na	ns	na
Workplace role										
Director/owner	38.9	72	34.3	73	41.2	51	46.0	37	ns	ns
Lead teacher	19.4	72	23.3	73	17.6	51	27.0	37	ns	ns
Teacher	13.9	72	11.0	73	11.8	51	5.4	37	ns	ns
Aide/assistant teacher	22.2	72	23.3	73	21.6	51	13.5	37	ns	ns
Other role	5.6	72	8.2	73	7.8	51	8.1	37	ns	ns
Workplace role missing	6.5	77	6.4	78	33.8	77	52.6	78	ns	*

Participant characteristic	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 77)		Control (*n* = 78)		Treatment (*n* = 77)		Control (*n* = 78)			
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Workplace type										
Child care center	40.0	70	40.3	72	na	na	na	na	ns	na
Head Start/Early Head Start	21.4	70	16.7	72	na	na	na	na	ns	na
Home-based care	31.4	70	36.1	72	na	na	na	na	ns	na
Relief nursery, elementary school, or other	7.1	70	6.9	72	na	na	na	na	ns	na
Program type missing	9.1	77	7.7	78	na	na	na	na	ns	na
Rerandomization balance variables										
Step 7	70.1	77	62.8	78	na	na	na	na	ns	na
Step 8	14.3	77	21.8	78	na	na	na	na	ns	na
Step missing	0.0	77	0.0	78	na	na	na	na	ns	na
Step path: College course credit	41.1	73	51.4	70	na	na	na	na	ns	na
Step path: Community-based training	37.0	73	31.4	70	na	na	na	na	ns	na
Path missing	5.2	77	10.3	78	na	na	na	na	ns	na
Ages of children in your program: preschool	90.1	71	89.0	73	na	na	na	na	ns	na
Ages of children in your program: school-age	38.0	71	43.8	73	na	na	na	na	ns	na
Ages of children in your program missing	7.8	77	6.4	78	na	na	na	na	ns	na
Tenure, overall (standardized)	32.9	68	43.7	68	na	na	na	na	ns	na
Tenure missing	11.7	77	12.8	78	na	na	na	na	ns	na
Plan to continue working in this field for more than five years	73.6	72	80.8	73	na	na	na	na	ns	na
Plan to continue working in this field for more than five years missing	6.5	77	6.4	78	na	na	na	na	ns	na
Expect a raise with a higher degree at baseline	53.7	67	55.4	65	na	na	na	na	ns	na

Participant characteristic	At time of assignment: Treatment (*n* = 77) Percent	At time of assignment: Treatment (*n* = 77) Number	At time of assignment: Control (*n* = 78) Percent	At time of assignment: Control (*n* = 78) Number	At end of study period: Treatment (*n* = 77) Percent	At end of study period: Treatment (*n* = 77) Number	At end of study period: Control (*n* = 78) Percent	At end of study period: Control (*n* = 78) Number	Significance: At time of assignment	Significance: At end of study period
Expect a raise with a higher degree missing	13.0	77	16.7	78	na	na	na	na	ns	na
Enrolled in a college course at baseline	15.9	63	20.6	63	na	na	na	na	ns	na
Enrolled in a college course missing	18.2	77	19.2	78	na	na	na	na	ns	na
Plan to continue formal education	57.3	68	62.0	71	na	na	na	na	ns	na
Plan to continue formal education missing	11.7	77	9.0	78	na	na	na	na	ns	na
Workplace is very supportive of participating in ongoing professional development at baseline	55.6	63	50.0	62	na	na	na	na	ns	na
Workplace is very supportive of participating in ongoing professional development missing	18.2	77	20.5	78	na	na	na	na	ns	na

* Significant at $p < .05$; ** significant at $p < .01$.
na is not applicable. ns is not significant.
Note: No differences between groups for the monetary incentive randomization were significant at $p < .001$.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Table B5. Incentive randomization: Characteristics of automatic scholarship enrollment participants at time of assignment and end of study period, 2018 and 2019

	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 80)		Control (*n* = 78)		Treatment (*n* = 80)		Control (*n* = 78)			
Participant characteristic	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Female	98.8	80	96.1	78	98.8	80	96.1	78	ns	ns
Gender missing	0.0	80	0.0	78	0.0	80	0.0	78	ns	ns
Race/ethnicity										
White	64.1	78	68.0	75	64.1	78	68.0	75	ns	ns
Latinx	29.5	78	24.0	75	29.5	78	24.0	75	ns	ns
Non-Latinx educator of color	6.4	78	8.0	75	6.4	78	8.0	75	ns	ns
Race/ethnicity missing	2.5	80	3.8	78	2.5	80	3.8	78	ns	ns
Age (years)	40.7	80	43.8	78	42.1	80	45.1	78	ns	ns
Lives in urban area	71.2	80	76.9	78	71.2	80	76.9	78	ns	ns
Lives in rural area	28.7	80	23.1	78	28.7	80	23.1	78	ns	ns
Primary language										
English	80.0	80	84.6	78	80.0	80	84.6	78	ns	ns
Non-English	20.0	80	15.4	78	20.0	80	15.4	78	ns	ns
Primary language missing	0.0	80	0.0	78	0.0	80	0.0	78	ns	ns
Highest level of education (self-reported)										
High school diploma or less	17.5	80	16.0	75	25.7	74	27.5	69	ns	ns
Some college or other professional certificate	45.0	80	48.0	75	35.1	74	40.6	69	ns	ns
Associate degree	15.0	80	10.7	75	14.9	74	10.1	69	ns	ns
Bachelor's degree or more	22.5	80	25.3	75	24.3	74	21.7	69	ns	ns
Self-reported education missing	0.0	80	3.8	78	7.5	80	11.5	78	*	ns

Participant characteristic	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 80)		Control (*n* = 78)		Treatment (*n* = 80)		Control (*n* = 78)			
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Most recent step number										
Step 7	68.8	80	61.5	78	60.0	80	50.0	78	ns	ns
Step 7.5	11.2	80	15.4	78	13.8	80	12.8	78	ns	ns
Step 8	20.0	80	23.1	78	21.3	80	24.4	78	ns	ns
Step 8.5	0.0	80	0.0	78	1.3	80	10.3	78	ns	*
Step 9	0.0	80	0.0	78	2.5	80	1.3	78	ns	ns
Step 9.5	0.0	80	0.0	78	0.0	80	0.0	78	ns	ns
Step 10	0.0	80	0.0	78	1.3	80	1.3	78	ns	ns
Step 11	0.0	80	0.0	78	0.0	80	0.0	78	ns	ns
Most recent step path										
Degree, certificate, credential	16.2	80	16.7	78	16.2	80	17.9	78	ns	ns
College course credit	55.0	80	50.0	78	53.8	80	47.4	78	ns	ns
Community-based training	17.5	80	17.9	78	16.2	80	17.9	78	ns	ns
Combination	11.2	80	15.4	78	13.8	80	16.7	78	ns	ns
Step 1–6 undifferentiated in data	0.0	80	0.0	78	0.0	80	0.0	78	ns	ns
Job characteristics										
Tenure, overall (years)	10.5	64	12.2	68	na	na	na	na	ns	na
Tenure missing	20.0	80	12.8	78	na	na	na	na	ns	na
Workplace role										
Director/owner	35.1	74	34.3	73	39.6	48	46.0	37	ns	ns
Lead teacher	24.3	74	23.3	73	27.1	48	27.0	37	ns	ns
Teacher	20.3	74	11.0	73	12.5	48	5.4	37	ns	ns
Aide/assistant teacher	16.2	74	23.3	73	6.3	48	13.5	37	ns	ns
Other role	4.1	74	8.2	73	14.6	48	8.1	37	ns	ns
Workplace role missing	7.5	80	6.4	78	40.0	80	52.6	78	ns	ns

Participant characteristic	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 80)		Control (*n* = 78)		Treatment (*n* = 80)		Control (*n* = 78)			
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Workplace type										
Child care center	44.6	74	40.3	72	na	na	na	na	ns	na
Head Start/Early Head Start	20.3	74	16.7	72	na	na	na	na	ns	na
Home-based care	31.1	74	36.1	72	na	na	na	na	ns	na
Relief nursery, elementary school, or other	4.1	74	6.9	72	na	na	na	na	ns	na
Program type missing	7.5	80	7.7	78	na	na	na	na	ns	na
Rerandomization balance variables										
Step 7	70.0	80	62.8	78	na	na	na	na	ns	na
Step 8	18.8	80	21.8	78	na	na	na	na	ns	na
Step missing	0.0	80	0.0	78	na	na	na	na	ns	na
Step path: college course credit	55.8	77	51.4	70	na	na	na	na	ns	na
Step path: community-based training	26.0	77	31.4	70	na	na	na	na	ns	na
Path missing	3.8	80	10.3	78	na	na	na	na	ns	na
Ages of children in your program: preschool	94.6	74	89.0	73	na	na	na	na	ns	na
Ages of children in your program: school-age	47.3	74	43.8	73	na	na	na	na	ns	na
Ages of children in your program missing	7.5	80	6.4	78	na	na	na	na	ns	na
Tenure, overall	23.7	64	43.7	68	na	na	na	na	ns	na
Tenure missing	20.0	80	12.8	78	na	na	na	na	ns	na
Plan to continue working in this field for more than five years	83.6	73	80.8	73	na	na	na	na	ns	na
Plan to continue working in this field for more than five years missing	8.7	80	6.4	78	na	na	na	na	ns	na
Expect a raise with a higher degree at baseline	53.5	71	55.4	65	na	na	na	na	ns	na
Expect a raise with a higher degree missing	11.2	80	16.7	78	na	na	na	na	ns	na

Participant characteristic	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 80)		Control (*n* = 78)		Treatment (*n* = 80)		Control (*n* = 78)			
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Enrolled in a college course at baseline	25.0	64	20.6	63	na	na	na	na	ns	na
Enrolled in a college course missing	20.0	80	19.2	78	na	na	na	na	ns	na
Plan to continue formal education	66.2	68	62.0	71	na	na	na	na	ns	na
Plan to continue formal education missing	15.0	80	9.0	78	na	na	na	na	ns	na
Workplace is very supportive of participating in ongoing professional development at baseline	47.7	65	50.0	62	na	na	na	na	ns	na
Workplace is very supportive of participating in ongoing professional development missing	18.8	80	20.5	78	na	na	na	na	ns	na

* Significant at $p < .05$.
na is not applicable. ns is not significant.
Note: No differences between groups for the automatic scholarship enrollment randomization were significant at $p < .01$.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Table B6. Sign-up randomization: Confirmatory and secondary outcomes at time of assignment and end of study period, 2018 and 2019

	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 140)		Control (*n* = 149)		Treatment (*n* = 140)		Control (*n* = 149)			
Outcome	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Confirmatory outcomes										
Enrolled in career lattice	0.0	140	0.0	149	18.6	140	15.4	149	ns	ns
Workplace retention	na	na	na	na	80.3	137	81.1	143	na	ns
Secondary outcomes										
Entry step										
Step 1	0.0	140	0.0	149	0.7	140	0.0	149	ns	ns
Step 2	0.0	140	0.0	149	3.6	140	6.0	149	ns	ns
Step 3	0.0	140	0.0	149	5.7	140	2.0	149	ns	ns
Step 4	0.0	140	0.0	149	0.0	140	2.7	149	ns	ns
Step 5	0.0	140	0.0	149	2.1	140	1.3	149	ns	ns
Step 6	0.0	140	0.0	149	0.0	140	0.0	149	ns	ns
Step 7	0.0	140	0.0	149	2.1	140	4.0	149	ns	ns
Step 7.5	0.0	140	0.0	149	0.0	140	0.7	149	ns	ns
Step 8	0.0	140	0.0	149	0.7	140	0.0	149	ns	ns
Step 8.5	0.0	140	0.0	149	0.0	140	0.7	149	ns	ns
Step 9	0.0	140	0.0	149	0.7	140	1.3	149	ns	ns
Step 9.5	0.0	140	0.0	149	0.0	140	0.0	149	ns	ns
Step 10	0.0	140	0.0	149	2.1	140	3.4	149	ns	ns
Step 11	0.0	140	0.0	149	0.7	140	0.7	149	ns	ns
Highest degree verified in the Oregon Registry Online										
No degree verified	91.4	140	90.6	149	90.7	140	88.6	149	ns	ns
Associate degree	1.4	140	2.7	149	2.1	140	3.4	149	ns	ns
Bachelor's degree	5.7	140	6.0	149	5.7	140	7.4	149	ns	ns
Master's degree or higher	1.4	140	0.7	149	1.4	140	0.7	149	ns	ns
Credential verified	0.0	140	0.7	149	1.4	140	2.7	149	ns	ns

Outcome	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 140)		Control (*n* = 149)		Treatment (*n* = 140)		Control (*n* = 149)			
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Increase in identification as a professional	na	na	na	na	18.4	49	28.0	50	na	ns
Increase in identification as a professional missing	na	na	na	na	65.0	140	66.4	149	na	ns

na is not applicable. ns is not significant.
Note: No differences between groups for the confirmatory and secondary outcomes in the sign-up randomization were significant at $p < .05$.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Table B7. Incentive randomization: Monetary incentive confirmatory and secondary outcomes at time of assignment and end of study period, 2018 and 2019

	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 77)		Control (*n* = 78)		Treatment (*n* = 77)		Control (*n* = 78)			
Outcome	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Confirmatory outcomes										
Increased at least one step in the career lattice	83.1	77	82.1	78	19.5	77	17.9	78	ns	ns
College credit hours earned between 9/1/2018 and 12/31/2019	na	na	na	na	15.1	77	19.0	78	na	ns
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	na	na	na	na	42.5	77	32.2	78	na	ns
Workplace retention	na	na	na	na	81.3	75	85.5	76	na	ns
Secondary outcomes										
Received at least one education award	na	na	na	na	15.6	77	1.3	78	na	**
Took college course since August 2018	na	na	na	na	19.2	52	30.8	39	na	ns
Took college course missing	na	na	na	na	32.5	77	50.0	78	ns	*
Plan to participate in future professional development	82.1	67	73.6	72	80.4	51	81.6	38	ns	ns
Plan to participate in future professional development missing	13.0	77	7.7	78	33.8	77	51.3	78	ns	*
Motivation to take a college course in the next year high or very high	37.5	64	39.1	64	48.1	52	30.8	39	ns	ns
Motivation to take a college course in the next year missing	16.9	77	17.9	78	32.5	77	50.0	78	ns	*
Motivation to take a college course in the next five years high or very high	48.4	64	44.4	63	44.2	52	41.0	39	ns	ns
Motivation to take a college course in the next five years missing	16.9	77	19.2	78	32.5	77	50.0	78	ns	*
Motivation to earn a degree in the next five years high or very high	43.8	64	56.3	64	40.4	52	43.6	39	ns	ns

Outcome	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 77)		Control (*n* = 78)		Treatment (*n* = 77)		Control (*n* = 78)			
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Motivation to earn a degree in the next five years missing	16.9	77	17.9	78	32.5	77	50.0	78	ns	*
Increase in identification as a professional	na	na	na	na	18.4	49	16.2	37	na	ns
Increase in identification as a professional missing	na	na	na	na	36.4	77	52.6	78	na	*

* Significant at $p < .05$; ** significant at $p < .01$.
na is not applicable. ns is not significant.
Note: No differences between groups for the confirmatory and secondary outcomes in the monetary incentive randomization were significant at $p < .001$.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Table B8. Incentive randomization: Automatic scholarship enrollment confirmatory and secondary outcomes at time of assignment and end of study period, 2018 and 2019

	At time of assignment				At end of study period					
	Treatment (*n* = 80)		Control (*n* = 78)		Treatment (*n* = 80)		Control (*n* = 78)		Significance	
Outcome	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Confirmatory outcomes										
Received a community college scholarship	na	na	na	na	6.3	80	2.6	78	na	ns
Increased at least one step in the career lattice	81.3	80	82.1	78	10.0	80	17.9	78	ns	ns
College credit hours earned between 9/1/2018 and 12/31/2019	na	na	na	na	16.0	80	19.0	78	na	ns
Workplace retention	na	na	na	na	83.7	80	85.5	76	na	ns
Secondary outcomes										
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	na	na	na	na	37.9	80	32.2	78	na	ns
Took college course since August 2018	na	na	na	na	35.4	48	30.8	39	na	ns
Took college course missing	na	na	na	na	40.0	80	50.0	78	na	ns
Plan to participate in future professional development	73.5	68	73.6	72	68.8	48	81.6	38	ns	ns
Plan to participate in future professional development missing	15.0	80	7.7	78	40.0	80	51.3	78	ns	ns
Motivation to take a college course in the next year high or very high	50.8	65	39.1	64	54.2	48	30.8	39	ns	*
Motivation to take a college course in the next year missing	18.8	80	17.9	78	40.0	80	50.0	78	ns	ns
Motivation to take a college course in the next five years high or very high	56.9	65	44.4	63	54.2	48	41.0	39	ns	ns
Motivation to take a college course in the next five years missing	18.8	80	19.2	78	40.0	80	50.0	78	ns	ns
Motivation to earn a degree in the next five years high or very high	61.5	65	56.3	64	56.3	48	43.6	39	ns	ns

Outcome	At time of assignment				At end of study period				Significance	
	Treatment (*n* = 80)		Control (*n* = 78)		Treatment (*n* = 80)		Control (*n* = 78)			
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	At time of assignment	At end of study period
Motivation to earn a degree in the next five years missing	18.8	80	17.9	78	40.0	80	50.0	78	ns	ns
Sense of identification as a professional: strongly agree	57.5	73	67.1	73	72.9	48	56.4	39	ns	ns
Identification as a professional missing	8.7	80	6.4	78	40.0	80	50.0	78	ns	ns
Increase in identification as a professional	na	na	na	na	18.2	44	16.2	37	na	ns
Increase in identification as a professional missing	na	na	na	na	45.0	80	52.6	78	na	ns

* Significant at $p < .05$.
na is not applicable. ns is not significant.
Note: No differences between groups for the confirmatory and secondary outcomes in the automatic scholarship enrollment randomization were significant at $p < .01$.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Table B9. Demographic characteristics of Oregon's early childhood education workforce and study samples, 2018 (percent, unless otherwise indicated)

	State		Sign-up randomization		Incentive randomization	
Demographic characteristic	Number[a]	Mean	Number[a]	Mean	Number[a]	Mean
Female	18,218	94.1	186	93.5	235	97.4
Race/ethnicity						
White	17,604	69.6	253	64.0	230	64.3
Latinx	17,604	19.0	253	22.5	230	25.7
Neither White nor Latinx	17,604	10.6	253	13.4	230	10.0
Age (years)	24,157	37.2	289	36.2	235	42.6
Primary language						
English	18,963	85.2	193	84.5	235	81.7
Non-English	18,963	14.8	193	15.5	235	18.3
Highest level of education						
High school diploma or less	17,797	30.7	272	26.5	232	18.5
Some college or other professional certificate	17,797	23.1	272	23.9	232	46.6
Associate degree	17,797	13.5	272	11.0	232	12.9
Bachelor's degree or higher	17,797	32.7	272	38.6	232	22.0
Job characteristics						
Workplace role						
Less than a lead teacher	24,203	70.2	242	78.5	219	41.6
Lead teacher	24,203	11.3	242	13.6	219	22.4
Supervisor or above	24,203	18.6	242	7.9	219	36.1
Workplace type						
Certified child care center	24,203	77.0	242	87.6	216	67.1
Not certified child care center	24,203	23.0	242	12.4	216	32.9
Missing records						
Gender missing	24,203	24.7	289	35.6	235	0.0
Race/ethnicity missing	24,203	27.3	289	12.5	235	2.1
Age missing	24,203	0.2	289	0.0	235	0.0
Primary language missing	24,203	21.7	289	33.2	235	0.0
Self-reported education missing	24,203	26.5	289	5.9	235	1.3
Workplace role missing	24,203	0.0	289	16.3	235	6.8
Workplace type missing	24,203	0.0	289	16.3	235	8.1

Note: Total possible records were 24,203 for state data, 289 for sign-up randomization, and 235 for incentive randomization. Group percentages might not sum to 100 percent because of rounding.

a. Refers to the number of nonmissing values available as the denominator to calculate the percentage of the group with the listed characteristic.

Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018; state figures are from Oregon Center for Career Development in Childhood Care and Education and Oregon Childcare Research Partnership (2019).

Table B10. Demographic characteristics of early childhood education workforce members not in the Oregon early childhood education career lattice and individuals at step 7, 7.5, or 8 in the career lattice compared with study samples, 2018

Panel A. Workforce members not in the Oregon early childhood education career lattice (sign-up randomization)

	State		Sign-up randomization	
Demographic characteristic	Number[a]	Mean	Number[a]	Mean
Race/ethnicity				
White	2,300	69.3	253	64.0
Latinx	2,300	18.3	253	22.5
Neither White nor Latinx	2,300	12.4	253	13.4
Primary language				
English	2,499	89.4	193	84.5
Non-English	2,499	10.6	193	15.5
Highest level of education				
High school diploma or less	2,128	52.2	272	26.5
Some college or other professional certificate	2,128	6.3	272	23.9
Associate degree	2,128	10.7	272	11.0
Bachelor's degree or higher	2,128	30.8	272	38.6
Job characteristics				
Workplace role				
Less than a lead teacher	5,617	91.9	242	78.5
Lead teacher	5,617	2.2	242	13.6
Supervisor or above	5,617	5.9	242	7.9
Workplace type				
Certified child care center	5,617	80.4	242	87.6
Not certified child care center	5,617	19.6	242	12.4
Missing records				
Race/ethnicity missing	5,617	59.0	289	12.5
Primary language missing	5,617	55.5	289	33.2
Self-reported education missing	5,617	62.1	289	5.9
Workplace role missing	5,617	0.0	289	16.3
Workplace type missing	5,617	0.0	289	16.3

Panel B. Workforce members at step 7, 7.5, or 8 in the career lattice (incentive randomization)

	State		Incentive randomization sample	
Demographic characteristic	Number[a]	Mean	Number[a]	Mean
Race/ethnicity				
White	1,705	63.1	230	64.3
Latinx	1,705	27.6	230	25.7
Neither White nor Latinx	1,705	9.4	230	10.0
Primary language				
English	1,715	77.3	235	81.7
Non-English	1,715	22.7	235	18.3
Highest level of education				
High school diploma or less	1,382	48.8	232	18.5
Some college or other professional certificate	1,382	22.3	232	46.6
Associate degree	1,382	10.0	232	12.9
Bachelor's degree or higher	1,382	19.0	232	22.0
Job characteristics				
Workplace role				
Less than a lead teacher	1,756	65.0	219	41.6
Lead teacher	1,756	10.8	219	22.4
Supervisor or above	1,756	24.3	219	36.1
Workplace type				
Certified child care center	1,756	77.0	216	67.1
Not certified child care center	1,756	23.0	216	32.9
Missing records				
Race/ethnicity missing	1,756	2.9	235	2.1
Primary language missing	1,756	2.3	235	0.0
Self-reported education missing	1,756	21.3	235	1.3
Workplace role missing	1,756	0.0	235	6.8
Workplace type missing	1,756	0.0	235	8.1

Note: Data were not available for all eligible members of the population. Total possible records were 5,617 for state data in panel A, 289 for sign-up randomization in panel A, 1,756 for state data in panel B, and 235 for incentive randomization in panel B. Group percentages might not sum to 100 percent because of rounding.

a. Refers to the number of nonmissing values available as the denominator to calculate the percentage of the group with the listed characteristic.

Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education (OCCD) data from 2018; state figures were reported by OCCD to the study team as of 2018.

Table B11. Power calculations for study sample sizes

Outcome	*R*-squared	Minimum detectable effect size		Sample size
		α = 0.05	α = 0.1	
Sign-up randomization				
Enrolled in career lattice between 10/12/2018 and 12/31/2019	0.1030	0.278	0.237	289
Retained	0.0909	0.284	0.242	280
Incentive randomization: Monetary incentive				
Increased at least one step in the career lattice since 9/1/2018	0.2716	0.343	0.292	155
College credit hours earned between 9/1/2018 and 12/31/2019	0.1837	0.363	0.309	155
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	0.2235	0.354	0.302	155
Retained	0.2482	0.353	0.301	151
Incentive randomization: Automatic scholarship enrollment				
Received a community college scholarship	0.2143	0.352	0.301	158
Increased at least one step in the career lattice between 9/1/2018 and 12/31/2019	0.2783	0.338	0.288	158
College credit hours recorded between 9/1/2018 and 12/31/2019	0.2246	0.350	0.299	158
Retained	0.2162	0.354	0.302	156

Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Attrition. In the follow-up survey the attrition rate was 61 percent for the sign-up randomization and 40 percent for the combined arms of the incentive randomization (table B12). Differential attrition was 2 percent for the sign-up randomization and 13 percent for the incentive randomization. The high overall attrition rates for both randomizations and the differential attrition rate for the incentive randomization mean that less reliance can be placed on results using data from the follow-up survey. Under What Works Clearinghouse guidelines on attrition and optimistic assumptions that the treatment is unrelated to attrition for either randomization, the threat of bias is considered unacceptable, and attrition is considered high (U.S. Department of Education, 2017).

Table B12. Overall attrition on the follow-up survey was high for both randomizations, and differential attrition was present for the incentive randomization

Item	Sign-up randomization			Incentive randomizations				
	Control	Treatment	Total	Control	Automatic scholarship enrollment	Monetary incentive	Combined (scholarship and monetary incentive)	Total
Number of participants randomized	149	140	289	78	80	77	157	235
Number of follow-up survey responses	56	56	112	40	49	52	101	141
Response rate (percent)	38	40	39	51	61	68	64	60
Overall attrition (percent)	62	60	61	49	39	32	36	40
Differential attrition (percent)	na	na	2	na	na	na	na	13

na is not applicable.

Note: Number of participants randomized is the number of participants allocated to the treatment and control groups, excluding those who were determined to be ineligible based only on characteristics determined prior to the intervention and applied in the same way to the treatment and control groups (such as already being in the career lattice for the sign-up randomization and being at a higher step for the incentive randomization).

Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Methodology

The study team examined the impact of the interventions by comparing outcomes for ECE professionals between the treatment and control groups for each trial separately. Among significant findings, meaningful differences in outcomes were those greater than 0.20 standard deviation (following broad benchmarks for intervention effect sizes, as specific benchmarks for early educator interventions are not established in the literature; Cohen, 1988). Estimates are reported as statistically significant if below the .10 level to account for lower power to detect effects due to smaller sample sizes.

The main and secondary outcomes were analyzed for both randomizations. Main outcome data had little or no missing information, while secondary outcomes were from survey data with missing information, which caused challenges for the analysis (see box 2 in the main report and the "Data" section earlier in this appendix for more information on missing data). As described in the "Key variables and outcome measures" section above, the main outcomes for the sign-up intervention were an indicator for career lattice sign-up and an indicator of retention at the same workplace during the study period. The main outcomes for the incentive randomization differed for the two treatments. For the case of the automatic scholarship enrollment, the main outcomes were indicators for using a scholarship, increasing at least one step in the career lattice, college credit hours earned, and retention since randomization. The main outcomes for the monetary incentive treatment were the number of professional development hours recorded, the number of college credits earned, an increase of at least one step in the career lattice, and workplace retention since randomization. Secondary outcomes are described in the "Exploratory analysis" section below.

The sign-up randomization was conducted at the individual level, and all analyses were also conducted at the individual level. The incentive randomization was conducted at the workplace level, but the analysis was conducted at the individual level due to very little clustering of individuals within the workpalce.[2] The impact of receiving the nudge, known as the intent-to-treat (ITT) effect in econometric terminology, was estimated for each treatment group and randomization. For binary outcomes, such as indicators for enrollment in the career lattice, a linear probability model was used.

For research question 1 the ITT effect of the emails (to sign up for the career lattice) on the binary main outcome (the indicator for career lattice sign-up) was estimated with the following model:

$$Y_i = \beta_0 + \beta_1 Treat_i + \mathbf{X}\Theta + \varepsilon_i \quad \text{(B1)}$$

where Y is the binary outcome measure for educator *i*, *Treat* is an indicator variable taking a value of 1 for the treatment group and 0 for the control group, ε is the error term that is assumed to be distributed N(0,σ^2), and $\mathbf{X}$ represents a vector of control variables as summarized in table B2. The ITT effect is given by β_1 and is the difference in the outcome measure *Y* between educators who were randomly assigned to receive the nudge and those who were randomly assigned to not receive the nudge.

Due to the small sample sizes and interest in ensuring balance between the treatment and control groups for many covariates, a rerandomization procedure was employed. This means that the study team set a threshold of acceptance for the difference in specific treatment and control covariates,[3] ran repeated randomizations, and

[2] Standard errors were not clustered at the workplace level due to the few instances of clustering in the data.

[3] The covariates for the sign-up randomization were education level, race/ethnicity, years planned to continue in the workforce, age of children served, workplace type, whether planned to continue professional development, whether planned to continue education, strongly agree to identification as a professional, has the Child Development Associate credential, and missing response to being motivated to continue education and training. For the incentive randomization, the covariates were: step level, path in the career lattice, education level, age of children served, workplace type, standardized measure of years working, years planned to continue in the workforce, whether an increase in education or training would lead to a raise, when they last enrolled in a college course, planned to continue education, workplace very supportive of increasing education and training, and race/ethnicity.

randomly assigned the treatment condition to the units only after the threshold was met. This method not only permitted analysis of the findings without controls for baseline characteristics but also confirmed that the baseline characteristics used in the rerandomization procedure were indeed balanced in the analytic sample. Proper analysis of rerandomized trials involved calculating an adjusted *p*-value because analyzing rerandomized trials using standard methods resulted in a *p*-value that is too conservative. The adjusted *p*-value was estimated using randomization inference tests (Mihaly et al., forthcoming; Morgan & Rubin, 2015). Randomization inference considers what would have occurred under all possible random assignments and is performed at the analysis stage. The steps to randomization inference involve a Monte Carlo framework:

1. Preserve the original treatment assignment.
2. Generate placebo treatment statuses according to rerandomization assignment method.
3. Estimate the original regression equation substituting the original treatment assignment variable with a term for the placebo treatment.
4. Repeat steps 1–3 1,000 times.
5. The randomization inference *p*-value is the proportion of times the placebo treatment effect was larger than the estimated treatment effect.

The impact of the monetary incentive or automatic scholarship enrollment emails on binary outcomes (incentive randomization) for research questions 2 and 3 were modeled in the same way as described in equation B1. For continuous outcomes for research questions 1, 2, and 3, the outcome measure in equation B1 was replaced with Y, the continuous outcome, and the model was estimated using ordinary least squares.

Sensitivity analysis. The study team conducted sensitivity analyses to test the extent to which estimates were driven by model assumptions and to examine whether estimating the models including educator covariates would affect the findings. A missing indicator method was used to account for covariates that had missing data. The results were not sensitive to the set of control variables used.

Exploratory analysis. The exploratory analysis of secondary outcomes was conducted according to the models described above and included secondary outcomes from the surveys, where response rates were low for both randomizations, and treatment and control groups had different response rates for the incentive randomization. Outcomes drawn from the survey differed for each trial.

For the sign-up randomization the survey-derived outcome was:

- Reported increase in identification as a professional.

For the monetary incentive (incentive randomization) the survey-derived outcomes were:

- Reported motivation to take college coursework or complete a certification or degree.
- Reported increase in identification as a professional.

For the automatic scholarship enrollment (incentive randomization) the survey-derived outcomes were:

- Reported motivation to take college coursework or complete a certification or degree.
- Reported increase in identification as a professional.

The study team conducted exploratory analyses on groups of participants to gain a better understanding of the heterogeneity of the effects of nudges and incentive changes. They examined the differential impact of the interventions by individual factors, including age of the study participant (broken into three categories: younger than 35, 35–54, and 55 and older) at baseline; primary language at baseline (English or non-English); workplace

role at baseline (teacher, director, or owner compared with assistant teachers and aides); education level at baseline (associate degree or higher compared with lower than an associate degree); workplace at baseline (home-based care compared with center-based care, Head Start, preschool programs, and other types); race/ethnicity (educators of color compared with White educators); urban or rural location; and distance to the nearest Oregon public college or university (less than 5 miles, 5–20 miles, and more than 20 miles).

To estimate the group effects in the case where the group had two categories, equation B1 was modified to include an interaction term for treatment status and the group of interest *s* = 1,...,*S*:

$$Y = \beta_0 + \beta_1 Treat * (X_{si} = 1) + \beta_2 Treat * (X_{si} = 0) + X\Theta + \varepsilon_i \qquad \text{(B2)}$$

where $(X_{si} = 1)$ indicates that the group is true and $(X_{si} = 0)$ indicates that the group is false. For cases in which the group contained more than two categories, the model included an interaction term for the group in each of the possible scenarios with the treatment effect. All group analyses were conducted separately for each group.

For research question 4 the study team calculated descriptive statistics of survey questions and email platform data by intervention and treatment group status to report counts and percentages for items of interest. For the OCCD interview data formal theme coding was not conducted because of the small number of interviews; rather, the study team reported where an informant had specific information about an implementation topic and where consensus emerged across informants.

Missing data. Prior to starting the analyses, the study team examined the extent of missing data overall and by treatment group. Because the main outcomes were from administrative data, there were no missing data in those analyses. The secondary outcomes were from follow-up surveys and did suffer from high overall attrition for both randomizations and from differential attrition for the incentive randomization. However, because these were exploratory analyses and because of the low overall response rates to the follow-up survey, no procedures were implemented to account for missing outcome data for secondary outcomes.

Crossovers. The ITT analysis described above does not take into account whether educators received the emails for any of the three interventions across the two trials. It is possible that some treatment group educators did not receive the emails (for example, the email ended up in a junk email folder) or that some control group educators found out about the emails from colleagues. Because the study team was interested not only in whether the policy of sending emails was effective (as measured by the ITT effect) but also in whether the email itself was effective for the people who receive it, exploratory models of the treatment-on-the-treated (TOT) impact of the emails were estimated. An instrumental variable analysis was used to estimate the TOT effect. Specifically, the following pair of equations were estimated using the two-staged least squares methodology:

$$D_i = \theta Treat_i + \mu_i \qquad \text{(B3)}$$

$$Y = \delta D_i + X\Theta + \varepsilon_i \qquad \text{(B4)}$$

where *D* is an indicator for whether educator *i* received the email, Y is the binary outcome measure, and X and ε are as described above. Several options were considered to measure receipt of the email because there was a rich set of data on whether the respondent opened the email that was sent and whether the respondent clicked on any links within the email. For the analysis presented in the report, the first stage outcome measure *D* is an indicator for whether respondents opened and clicked on a link in at least one of the emails they received about the intervention. The random assignment to the treatment group (*Treat*) was used as an instrumental variable for having received the email in the second stage. The coefficient of interest was δ, which is the regression-adjusted estimate of the TOT effect.

Protocols

Sign-up randomization: Baseline survey protocol

What is your preferred email address?* _____

What is your secondary email address? _____

1. What is your full name (first and last name)? _____
2. What is your birthdate? MM/DD/YYYY? ___ (Month) __ (Day) _____ (Year)
3. What is the ZIP code of your primary residence? _____
4. What is the highest level of education you have achieved?

- No high school diploma or GED
- High school diploma or GED
- Some college but no degree or certificate
- Associate degree
- Bachelor's degree
- Master's degree
- Higher than a master's degree

5. Do you have a Child Development Associate (CDA) certification?

- Yes
- No
- Don't know

[skip logic: Only show if no to CDA question above]

6. Are you planning to get a Child Development Associate (CDA) certification?

- Yes
- No
- Don't know

7. Do you plan to continue your formal education (such as taking college classes)?

- Yes
- No
- Don't know

[skip logic: Only show if answer yes to formal education question above]

8. What is your educational goal?

- Additional college classes but no degree
- Associate degree
- Bachelor's degree
- Other (please specify)

9. Do you plan to participate in professional development for which you will not receive college or university course credit?

- Yes
- No
- Don't know

[skip logic: show if yes to continued education and/or training hours]

10. What motivates you to continue your education and training? Please check all that apply.

- Meet Office of Child Care licensing requirements
- My workplace requires me to continue education and training
- Get a job
- Receive a promotion/pay raise
- Scholarship money
- Personal growth
- Spark requirements
- Other (please specify)

[skip logic: show if no to both questions on continuing education and training hours]

11. What would motivate you to continue your education and training? Please check all that apply.

- Meet Office of Child Care licensing requirements
- My workplace requires me to continue education and training
- Get a job
- Receive a promotion/pay raise
- Scholarship money
- Personal growth
- Spark requirements
- Other (please specify)

12. What kind(s) of professional development do you find most helpful for learning new information/skills and applying knowledge in your work? Please select your top three types of professional development from the list below.

- Being observed and receiving feedback from another early learning professional
- Visiting or observing other child care classrooms
- Participating in online or distance learning (web-based classes, etc.)
- Taking college classes in a cohort group (e.g., a group that starts classes together)
- Taking college classes on your own
- Attending conferences
- Participating in a learning community with other early learning professionals
- Other (please specify)
- Other (please specify)
- Other (please specify)

The next set of questions will ask you about your workplace. If you work in more than one setting, please answer the following questions for the place where you work the most hours per week. If you work an equal number of hours at two or more workplaces, please pick one workplace for your responses.

13. Which best describes the program you work in?

- Head Start (excluding Early Head Start)
- Early Head Start
- Child care center
- Home-based care
- Relief Nursery
- Other (please specify): _____

14. What ages of children do you have in your program? Please check all that apply.

- Infant
- Toddler
- Preschool
- School-age (ages 5 to 12)
- Don't know

15. What is your current position? Please check the option that most closely matches your main role at your workplace.

- Director
- Provider/owner
- Lead /head teacher
- Teacher
- Assistant teacher
- Aide/assistant
- Other (please specify):

[skip logic: only show if answered director or provider/owner in prior question on position)

16. Does your workplace receive Preschool Promise funding?

- Yes
- No
- Don't know

17. How many years have you been working in this field (with children aged 0–5)? *Only count work in the childhood care and education field, which includes the following settings: certified family child care; registered family child care; certified child care center; for-profit, not-for-profit, or faith-based program; early intervention/early childhood special education; teen parent or relief nursery program; child care resource and referral agency; Head Start; state agency; consulting business; professional organization; higher education*

    _____

18. How long do you plan to continue working in this field (with children aged 0-5)?

- Less than 1 year
- 1–2 years
- 3–5 years
- More than five years

[skip logic: Only show if chose anything but More than 5 years in question above about years continue working]

19. Why do you plan to leave this field? [write in]

20. How strongly do you agree or disagree with the phrase "I feel like I am an early learning professional"? _____

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

21. What is your current hourly wage at your primary early learning job?

- Less than $10.50
- $10.50 to $11.99
- $12.00 to $12.99
- $13.00 to $15.99
- $16.00 to $19.99
- $20.00 or higher
- Don't know

22. For this study, OCCD will be contacting you through email. How often do you usually check your primary email? Please select the closest match.

- Hourly
- Daily
- Weekly
- Monthly

Finally, we want to ask you about your background to help us understand more about you.

23. Which race/ethnicity do you identify with? Please check all that apply.

- Don't want to answer
- American Indian or Alaska Native
- Hispanic or Latino/a
- Asian
- Native Hawaiian or Pacific Islander
- Black or African American
- Middle Eastern/Northern African
- White
- Other (please specify) _____
- Don't know

24. Any last comments or thoughts for us?

_____

Sign-up randomization: Follow-up survey protocol

1. What is your full name (first and last name)? _____

2. What is the highest level of education you have achieved?
- No high school diploma or GED
- High school diploma or GED
- Some college but no degree or certificate
- Associate degree
- Bachelor's degree
- Master's degree
- Higher than a master's degree

3. Do you plan to continue your formal education (such as taking college classes)?
- Yes
- No
- Don't know

4. Do you plan to participate in professional development for which you will not receive college or university course credit?
- Yes
- No
- Don't know

5. How strongly do you agree or disagree with the phrase "I feel like I am an early learning professional"? _____
- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

[Follow-up only questions (new questions)]

6. Do you know about the Oregon Registry Steps?
- Yes
- No
- Not sure

7. Do you know about the education awards offered by OCCD for advancing to certain Steps in the Oregon Registry?
- Yes
- No
- Not sure

8. Did you receive any emails encouraging you to sign up for the Oregon Registry Steps since August 2018?
- Yes
- No
- Don't know

[skip logic: show if Yes or Don't know on Q7]

9. Did you sign up for the Oregon Registry Steps?
- Yes
- No
- Don't know

[skip logic: Yes on Q8 and Q9 show Q10]

10. Did receiving an email encouraging you to sign up for the Oregon Registry Steps motivate you to sign up?
- Yes
- No
- Don't know

[skip logic: Yes on Q9 show Q11]

11. Why did you sign up for the Oregon Registry Steps? Please select all that apply.
- To receive an education award
- To be eligible for scholarships
- To be recognized for my educational achievements
- To help me plan my professional development
- To connect to others who care about children and families
- My employer required me
- Other (please specify): _____

[skip logic: Yes on Q9 show Q12]

12. How much has a Step on the Oregon Registry helped you …

a. Feel more professional?
b. Plan your professional development?
c. Connect to others who care about children and families?

- Helped a lot
- Helped a little
- Did not help at all

[skip logic: No on Q9 show Q13]

13. Why did you choose not to sign up for the Oregon Registry Steps? Please select all that apply.
- Didn't want to spend time signing up
- Not planning to continue in the field
- Not sure how to sign up
- Don't have the necessary paperwork
- Don't know about the Oregon Registry Steps
- Other (please specify): _____

[End follow-up section of new questions]

The next set of questions will ask you about your workplace. If you work in more than one setting, please answer the following questions for the place where you work the most hours per week. If you work an equal number of hours at two or more workplaces, please pick one workplace for your responses.

14. What is your current position? Please check the option that most closely matches your main role at your workplace.
- Director
- Provider/owner
- Lead /head teacher
- Teacher
- Assistant teacher
- Aide/assistant
- Other (please specify):

15. How long do you plan to continue working in this field (with children aged 0-5)?
- Less than 1 year
- 1–2 years
- 3–5 years
- More than 5 years

16. What is your current hourly wage at your primary early learning job?
- Less than $10.50
- $10.50 to $11.99
- $12.00 to $12.99
- $13.00 to $15.99
- $16.00 to $19.99
- $20.00 or higher
- Don't know

17. Any last comments or thoughts for us?

_____

Incentive randomization: Baseline survey protocol

1. What is your full name (first and last name)? _____

2. What is your birthdate? MM/DD/YYYY? ___ (Month) __ (Day) _____ (Year)

3. What is the ZIP code of your primary residence? _____

4. What is the highest level of education you have achieved?
- No high school diploma or GED
- High school diploma or GED
- Some college but no degree or certificate
- Associate degree
- Bachelor's degree
- Master's degree
- Higher than a master's degree

5. Do you have a Child Development Associate (CDA) certification?
- Yes
- No
- Don't know

[Skip logic: Only show if no to CDA question above]

6. Are you planning to get a Child Development Associate (CDA) certification?
- Yes
- No
- Don't know

The next set of questions will ask you about your workplace. If you work in more than one setting, please answer the following questions for the place where you work the most hours per week. If you work an equal number of hours at two or more workplaces, please pick one workplace for your responses.

7. Which best describes the program you work in?
- Head Start (excluding Early Head Start)
- Early Head Start
- Child care center
- Home-based care
- Relief nursery
- Other (please specify)

8. What ages of children do you have in your program? Please check all that apply.
- Infant
- Toddler
- Preschool
- School-age (ages 5 to 12)
- Don't know

9. What is your current position? Please check the option that most closely matches your main role at your workplace.
- Director
- Provider/owner
- Lead /head teacher
- Teacher
- Assistant teacher
- Aide/assistant
- Other (please specify):

[Skip logic: only show if answered director or provider/owner in prior question on position)

10. Does your workplace receive Preschool Promise funding?
- Yes
- No
- Don't know

11. How many years have you been working in this field? (with children aged 0–5)? *Only count work in the childhood care and education field, which includes the following settings: certified family child care; registered family child care; certified child care center; for-profit, not-for-profit, or faith-based program; early intervention/early childhood special education; teen parent or relief nursery program; child care resource and referral agency; Head Start; state agency; consulting business; professional organization; higher education*

12. How long do you plan to continue working in this field (with children aged 0–5)?
- Less than 1 year
- 1–2 years
- 3–5 years
- More than 5 years

[skip logic: only show if chose anything but more than five years in question above about years continue working]

13. Why do you plan to leave this field? [write-in]

14. How strongly do you agree or disagree with the phrase "I feel like I am an early learning professional"? _____
- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

15. What is your current hourly wage at your primary early learning job?
- Less than $10.50
- $10.50 to $11.99
- $12.00 to $12.99
- $13.00 to $15.99
- $16.00 to $19.99
- $20.00 or higher
- Don't know

16. Would you expect to receive a raise at your current job if you earned a higher educational degree than you currently have?
- Yes
- No
- Don't know

17. When did you last take a college course? A college course could be at a community college or university.
- I am currently enrolled in a college course for Fall 2018
- Within the last year (2017 – 2018 school year) but not currently
- Within the last three years
- Within the last five years
- Within the last ten years
- More than ten years ago

18. When did you last participate in professional development for which you did not receive college or university course credit?
- I am currently taking professional development
- Within the last 12 months but not currently
- 1–2 years ago
- More than 2 years ago

19. What is your level of motivation to take a college course in the next 12 months?
- Very low
- Low
- Moderate
- High
- Very high

20. What is your level of motivation to take a college course in the next 5 years?
- Very low
- Low
- Moderate
- High
- Very high

21. What is your level of motivation to earn a higher educational degree or early childhood education-related certification in the next 5 years?
- Very low
- Low
- Moderate
- High
- Very high

22. Do you plan to continue your formal education (such as taking college classes)?
- Yes
- No
- Don't know

[skip logic: only show if answer yes to formal education question above]

23. What is your educational goal?
- Additional college classes but no degree
- Associate degree
- Bachelor's degree
- Other (please specify)

24. Do you plan to participate in professional development for which you will not receive college or university course credit?
- Yes
- No
- Don't know

[skip logic: show if yes to continued education and/or training hours]

25. What motivates you to advance your education? Please check all that apply.

- Meet Office of Child Care licensing requirements
- My workplace requires me to continue education and training
- Get a job
- Receive a promotion/pay raise
- Scholarship money
- Personal growth
- Spark requirements
- Other (please specify)

[skip logic: show if no to both questions on continuing education and training hours]

26. What would motivate you to advance your education? Please check all that apply.

- Meet Office of Child Care licensing requirements
- My workplace requires me to continue education and training
- Get a job
- Receive a promotion/pay raise
- Scholarship money
- Personal growth
- Spark requirements
- Other (please specify)

27. What kind(s) of professional development do you find most helpful for learning new information/skills and applying knowledge in your work? Please select your top three types of professional development from the list below.

- Being observed and receiving feedback from another early learning professional
- Visiting or observing other child care classrooms
- Participating in online or distance learning (web-based classes, etc.)
- Taking college classes in a cohort group (e.g., a group that starts classes together)
- Taking college classes on your own
- Attending conferences
- Participating in a learning community with other early learning professionals
- Other (please specify)
- Other (please specify)
- Other (please specify)

28. What factors affect your decision to continue your education? Please rank your selections with the most important factor ranked first. You do not need to rank all the options provided.

- Cost
- Distance
- Time
- Difficulty of subject matter
- Family commitments
- Language barrier
- Other

29. If you selected 'Other' in the previous question, please describe the other factors that affect your decision to continue your education. [open-ended]

30. What support would best help you connect to formal education and professional development? [open-ended]

31. How supported do you feel by your workplace to participate in ongoing professional development?
- Very supported
- Somewhat supported
- Not supported

32. Are you or were you part of a Child Care Network (a cohort learning system for home-based child care providers)?
- Yes
- No
- Don't know

33. For this study, OCCD will be contacting you through email. How often do you usually check your primary email? Please select the closest match.
- Hourly
- Daily
- Weekly
- Monthly

Finally, we want to ask you about your background to help us understand more about you.

34. With which race/ethnicity do you identify with? Please check all that apply.
- Don't want to answer
- American Indian or Alaska Native
- Hispanic or Latino/a
- Asian
- Native Hawaiian or Pacific Islander
- Black or African American
- Middle Eastern/Northern African
- White
- Other (please specify) _____
- Don't know

35. Any last comments or thoughts for us?

_____

Incentive randomization: Follow-up survey protocol

1. What is your full name (first and last name)? _____

2. What is the highest level of education you have achieved?
- No high school diploma or GED
- High school diploma or GED
- Some college but no degree or certificate
- Associate degree
- Bachelor's degree
- Master's degree
- Higher than a master's degree

3. How strongly do you agree or disagree with the phrase "I feel like I am an early learning professional"? _____
- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

4. What is your level of motivation to take a college course in the next 12 months?
- Very low
- Low
- Moderate
- High
- Very high

5. What is your level of motivation to take a college course in the next 5 years?
- Very low
- Low
- Moderate
- High
- Very high

6. What is your level of motivation to earn a higher educational degree or early childhood education-related certification in the next 5 years?
- Very low
- Low
- Moderate
- High
- Very high

Follow-up only

7. Did you take any college or university courses since August 2018?
- Yes
- No
- Don't know

[skip logic: show Q8 if yes on Q7]

8. Were any of these courses on a semester schedule?
- Yes, some or all of my courses were on a semester schedule
- No, all of my courses were on a quarter schedule
- Don't know

[skip logic: show Q9-Q10 if yes on Q7]

9. How many fall 2018 college or university courses did you complete? ____

[skip logic: show Q10 if Q9 is greater than 0]

10. How many credits did you earn? ____

[skip logic: show Q11 if Q8 if yes or skipped and Q9 is greater than 0]

11. Were these courses on a quarter schedule or semester schedule?
- Quarter
- Semester

12. Do you plan to take any fall 2019 college or university courses?
- Yes
- No
- Don't know

13. When did you last participate in professional development for which you did not receive college or university course credit?
- I am currently taking professional development
- Within the last 12 months but not currently
- 1–2 years ago
- More than 2 years ago

[skip logic: show Q14 if Q13 is currently or within last 12 months]

14. Thinking about all of the professional development that you participated in from August 2018 through August 2019, approximately how many total hours did you participate?

15. Do you plan to participate in professional development for which you will not receive college or university course credit?
- Yes
- No
- Don't know

16. Do you know about the education awards offered by OCCD for advancing to certain Steps in the Oregon Registry?
- Yes
- No
- Not sure

[skip logic: show if yes to Q16]

17. To what extent do the education awards offered through OCCD motivate you to enroll in college courses, take professional development courses, or earn a degree or certificate?
- To a large extent
- To a moderate extent
- To a small extent
- Not at all

18. Did you receive any emails about eligibility for a special education award program for moving to your next Step on the Oregon Registry Steps since August 2018?
- Yes
- No
- Don't know

[skip logic: Only show Q19 if answered yes in Q18]

19. Did the email about eligibility for a special education award program for moving to your next Step on the Oregon Registry Steps motivate you to complete professional development or college coursework?
- Yes
- No
- Don't know

[skip logic: show if yes to Q16]

20. Since August 2018, did you apply for an education award through OCCD for advancing a Step in the Oregon Registry?
- Yes
- No
- Don't know

[skip logic: Show if no on Q20]

21. Why did you choose not to apply for an education award from OCCD? Please check all that apply.
- Unsure of application process
- Did not qualify for an award since August 2018
- Not interested in taking more courses or training needed to move up a Step
- Didn't want to deal with paperwork
- Didn't want to provide information specific to the W-9 form in the application
- Award amount wasn't enough to interest me
- Other (please specify): _____

22. How much has a Step on the Oregon Registry helped you…

a. Feel more professional?
b. Plan your professional development?
c. Connect to others who care about children and families?

- Helped a lot
- Helped a little
- Did not help at all

23. Do you know about the scholarships offered by OCCD to help you pursue additional training and education?

- Yes
- No
- Unsure

[skip logic: show if yes to Q23]

24. To what extent do the scholarships offered through OCCD motivate you to enroll in college courses, take professional development courses, or earn a degree or certificate?

- To a large extent
- To a moderate extent
- To a small extent
- Not at all

25. Did you receive an email about being automatically enrolled in a scholarship program from OCCD since August 2018?

- Yes
- No
- Don't know

[skip logic: only show Q26 if answered yes in Q25]

26. Did the email about being automatically enrolled in a scholarship from OCCD motivate you to access the scholarship funds?

- Yes
- No
- Don't know

[skip logic: show Q27 if yes on Q23]

27. Did you try to access a scholarship from OCCD during the past year?

- Yes
- No
- Don't know

[skip logic: Only show Q28 if no to Q27]

28. Why did you not try to access a scholarship from OCCD? Please check all that apply.

- Not interested in taking college courses
- Don't have the time to take college courses
- Don't have financial need
- Didn't want to deal with paperwork
- Unable to get my supervisor to sign the application
- The college wouldn't get the scholarship money in time to cover costs
- Scholarship amount wouldn't cover enough of the costs of taking courses
- My college or university isn't eligible for the scholarship
- Other (please specify): _____

[End of follow up (new questions)]

The next set of questions will ask you about your workplace. If you work in more than one setting, please answer the following questions for the place where you work the most hours per week. If you work an equal number of hours at two or more workplaces, please pick one workplace for your responses.

29. What is your current position? Please check the option that most closely matches your main role at your workplace.

- Director
- Provider/owner
- Lead /head teacher
- Teacher
- Assistant teacher
- Aide/assistant
- Other (please specify):

30. How long do you plan to continue working in this field (with children aged 0-5)?

- Less than 1 year
- 1–2 years
- 3–5 years
- More than 5 years

31. What is your current hourly wage at your primary early learning job?

- Less than $10.50
- $10.50 to $11.99
- $12.00 to $12.99
- $13.00 to $15.99
- $16.00 to $19.99
- $20.00 or higher
- Don't know

32. Any last comments or thoughts for us?

_____

Oregon Center for Career Development in Childhood Care and Education staff interview protocol

1. Please describe your involvement in the process OCCD used to send out the study information on education awards and scholarship enrollment.
    a. In addition to the information you have provided in the [documentation], is there anything else you'd like to add regarding the process used to send out the emails? What went well and what didn't go as you had hoped?
    b. Probe: Which stakeholders were informed of the study? How were they informed? What was their involvement in the study or process of implementing the study? Do you think that other people would have heard about the study from these stakeholders?
    c. Probe: Were there any communications sent to the ECE workforce other than the survey invitations or email "nudge" messages (e.g., other stakeholders sent out messages or flyers)?

2. Were there any challenges or issues with this process (e.g., processing applications, bad email addresses; differences in ability to reach different workers by auspice, such as home-based providers; timeline constraints to stay on email reminders schedule)?
    a. If so, how were those issues addressed/resolved?
3. Why do you think that some people chose to opt out [of the emails]?
4. From your perspective, what do you believe was successful about:
    a. The email campaign?
    b. Administering the modified awards/scholarship program?
    c. OCCD's participation in the study?
5. Did you receive any comments or feedback from the ECE workforce in the study on the process (in addition to emails received)?
    a. Probe: Please provide specific examples of positive and negative feedback. (E.g., people liked the email style; people disliked getting reminder emails)
6. Did you receive any comments or feedback from other Oregon stakeholders on the process?
    a. Probe: Please provide specific examples of positive and negative feedback (e.g., heard comment at a meeting).
    b. Probe: Please describe your outreach to policymakers/stakeholders about this intervention. What were their reactions?
7. If you were to do this type of intervention again, is there anything you would do differently?
    a. In your opinion, given that we had to end earlier than planned, what is the ideal length of time that the email campaign could have lasted?
    b. How could the burden on OCCD staff have been lessened?
8. How do you think the study could influence OCCD's future work? What about state policy?
    a. Probe: Do you think you would do email campaigns again? For what purpose?
9. Is there any other feedback you would like to share with us about the intervention/process?

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Appendix C. Supporting analysis

This appendix provides additional analysis results related to estimated impacts and survey responses to support the information in the body of the report.

Sign-up randomization, additional analyses

The tables below show the treatment-on-the-treated estimates (table C1), group analyses for the sign-up randomization (table C2), and the secondary outcomes (table C3).

Table C1. Treatment-on-the-treated estimates of the sign-up email on career lattice sign-up and workplace retention during the study period, 2018 and 2019

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Estimated impact[a] (standard error[b])	Effect size[c]	Sample size[d]
Signed up for the career lattice between 10/12/2018 and 12/31/2019	0.186	0.154	0.102	0.282	289
	(0.390)	(0.363)	(0.158)		
Workplace retention	0.803	0.811	–0.046	–0.116	280
	(0.399)	(0.393)	(0.168)		

Note: None of the effects was statistically significant at $p < .10$.
a. Estimated using a linear probability model with an indicator for treatment.
b. Adjusted using randomization inference tests to account for the use of rerandomization. See appendix B for a description of how standard errors were estimated.
c. Calculated by dividing the estimated impact by the standard deviation of the outcome for the control group.
d. Refers to the sample size for the regression analysis and includes both treatment and control group participants who had data for the outcome.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

The email encouraging career lattice sign-up had no detectable impact on specific populations. Sending emails had no detectable impact on career lattice sign-up or workplace retention by age range, primary language, education level, race/ethnicity, workplace role, workplace type, urban or rural location, or distance to the closest in-state public college or university (table C2).

Table C2. Group analyses of the sign-up email on enrollment in the career lattice and workplace retention during the study period, 2018 and 2019

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Group 1 Estimated impact[a] (standard error[b])	Group 1 Effect size[c]	Group 2 Estimated impact[a] (standard error[b])	Group 2 Effect size[c]	Group 3 Estimated impact[a] (standard error[b])	Group 3 Effect size[c]	Sample size[d]
			Age group: Younger than 35		Age group: 35–54		Age group: 55 and older		
Signed up for the career lattice between 10/12/2018 and 12/31/2019	0.186	0.154	0.081	0.223	–0.048	–0.132	0.008	0.022	289
	(0.390)	(0.363)	(0.059)		(0.059)		(0.088)		
Workplace retention	0.803	0.811	–0.030	–0.076	0.050	0.127	–0.097	–0.248	280
	(0.399)	(0.393)	(0.060)		(0.067)		(0.110)		
			Primary language: English		Primary language: Non-English				
Signed up for the career lattice between 10/12/2018 and 12/31/2019	0.283	0.228	0.010	0.023	0.139	0.331	na	na	193
	(0.453)	(0.421)	(0.070)		(0.148)				
Workplace retention	0.730	0.758	–0.052	–0.122	0.058	0.135	na	na	184
	(0.446)	(0.431)	(0.070)		(0.141)				
			Workplace role: Teacher or above		Workplace role: Below teacher				
Signed up for the career lattice between 10/12/2018 and 12/31/2019	0.195	0.169	0.036	0.096	0.011	0.030	na	na	242
	(0.398)	(0.377)	(0.071)		(0.058)				
Workplace retention	0.783	0.814	0.006	0.016	–0.058	–0.149	na	na	233
	(0.414)	(0.391)	(0.069)		(0.067)				
			Education level: Associate degree or higher		Education level: Below associate degree				
Signed up for the career lattice between 10/12/2018 and 12/31/2019	0.194	0.167	0.038	0.100	0.019	0.050	na	na	272
	(0.397)	(0.374)	(0.060)		(0.060)				
Workplace retention	0.794	0.803	0.072	0.180	–0.107	–0.268	na	na	263
	(0.406)	(0.399)	(0.054)		(0.071)				

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Group 1 Estimated impact[a] (standard error[b])	Group 1 Effect size[c]	Group 2 Estimated impact[a] (standard error[b])	Group 2 Effect size[c]	Group 3 Estimated impact[a] (standard error[b])	Group 3 Effect size[c]	Sample size[d]
			Race/ethnicity: White		Race/ethnicity: Other than White				
Signed up for the career lattice between 10/12/2018 and 12/31/2019	0.202	0.178	0.031	0.081	0.011	0.030	na	na	253
	(0.403)	(0.384)	(0.057)		(0.072)				
Workplace retention	0.787	0.789	–0.005	–0.012	0.003	0.006	na	na	245
	(0.411)	(0.410)	(0.059)		(0.081)				
			Workplace type: Home-based care		Workplace type: Not home-based care				
Signed up for the career lattice between 10/12/2018 and 12/31/2019	0.195	0.169	–0.029	–0.078	0.030	0.081	na	na	242
	(0.398)	(0.377)	(0.118)		(0.052)				
Workplace retention	0.783	0.814	–0.012	–0.032	–0.032	–0.082	na	na	233
	(0.414)	(0.391)	(0.122)		(0.058)				
			Lives in an urban area		Lives in a rural area				
Signed up for the career lattice between 10/12/2018 and 12/31/2019	0.186	0.154	0.017	0.048	0.095	0.261	na	na	289
	(0.390)	(0.363)	(0.046)		(0.100)				
Workplace retention	0.803	0.811	–0.025	–0.063	0.074	0.188	na	na	280
	(0.399)	(0.393)	(0.051)		(0.102)				

na is not applicable.
Note: None of the effects was statistically significant at $p < .10$.
a. Estimated using a linear probability model with an indicator for treatment.
b. Adjusted using randomization inference tests to account for the use of rerandomization. See appendix B for a description of how standard errors were estimated.
c. Calculated by dividing the estimated impact by the standard deviation of the outcome for the control group.
d. Refers to the sample size for the regression analysis and includes both treatment and control group participants that who had data for the outcome.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Table C3. The impact of the sign-up email on increase in identification as a professional during the study period, 2018 and 2019

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Estimated impact[a] (standard error[b])	Effect size[c]	Sample size[d]
Increase in identification as a professional	0.184	0.280	–0.130	–0.287	99
	(0.391)	(0.454)	(0.084)		

Note: None of the effects was statistically significant at $p < .10$.
a. Estimated using a linear probability model with an indicator for treatment.
b. Adjusted using randomization inference tests to account for the use of rerandomization. See appendix B for a description of how standard errors were estimated.
c. Calculated by dividing the estimated impact by the standard deviation of the outcome for the control group.
d. Refers to the sample size for the regression analysis and includes both treatment and control group participants who had data for the outcome.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Incentive randomization monetary incentive emails, additional analyses

The following tables show the treatment-on-the-treated estimates (table C4), the group analyses for the monetary incentive emails (table C5), and the secondary outcomes (table C6).

Table C4. Treatment-on-the-treated estimates of the monetary incentive emails on career lattice movement, college credit hours earned, community-based training hours recorded, and workplace retention during the study period, 2018 and 2019

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Estimated impact[a] (standard error[b])	Effect size[c]	Sample size[d]
Increased at least one step in the career lattice since 9/1/2018	0.195	0.179	0.088	0.228	155
	(0.399)	(0.386)	(0.166)		
College credit hours earned between 9/1/2018 and 12/31/2019	15.143	18.968	1.196	0.016	155
	(46.806)	(75.882)	(28.983)		
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	42.458	32.229	41.183*	1.382	155
	(48.034)	(29.797)	(19.539)		
Workplace retention	0.813	0.855	–0.176	–0.498	151
	(0.392)	(0.354)	(0.161)		

* significant at $p < .05$.
Note: Unless otherwise indicated, none of the effects was statistically significant at $p < .10$.
a. Estimated using a linear probability model with an indicator for treatment.
b. Adjusted using randomization inference tests to account for the use of rerandomization. See appendix B for a description of how standard errors were estimated.
b. Calculated by dividing the estimated impact by the standard deviation of the outcome for the control group.
c. Refers to the sample size for the regression analysis and includes both treatment and control group participants who had data for the outcome.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

The monetary incentive provided at earlier-than-usual steps in the career lattice had detectable differential impacts for some groups on training hours recorded and workplace retention but no impact on career lattice movement or college credit hours earned. The study team examined the impact of the monetary incentive provided at earlier-than-usual steps in the career lattice for groups of participants defined by age ranges, primary language, education levels, race/ethnicity, type of workplace, workplace roles, workplace type, urban or rural location, or distance to the closest in-state public college or university. There were statistically significant impacts on total community-based training hours recorded and workplace retention for some groups but no detectable impacts for any groups on increasing a career lattice step or college credit hours earned (table C5). Treated participants who were age 35–54, who had an education level below associate degree, or identified as White had higher average training hours recorded than the control group (by about 20, 16, and 16 hours, respectively). Treated participants who lived in a rural area or who were located more than 20 miles from the nearest public in-state college also had higher average training hours recorded than the control group (by about 22 hours and 34 hours, respectively). For workplace retention, treated participants who were age 55 or older or lived less than five miles from the nearest public in-state college were less likely to be retained at the same workplace (by 18 and 16 percentage points, respectively). While these differences were individually statistically significant, adjusting for the large number of comparisons eliminates significance.

Table C5. Group analyses of the monetary incentive emails on main outcomes during the study period, 2018 and 2019

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Group 1 Estimated impact[a] (standard error[b])	Group 1 Effect size[c]	Group 2 Estimated impact[a] (standard error[b])	Group 2 Effect size[c]	Group 3 Estimated impact[a] (standard error[b])	Group 3 Effect size[c]	Sample size[d]
			Age group: younger than 35		Age group: 35–54		Age group: 55 plus and older		
Increased at least one step in the career lattice since 9/1/2018	0.195	0.179	0.020	0.051	0.066	0.171	–0.061	–0.158	155
	(0.399)	(0.386)	(0.106)		(0.076)		(0.119)		
College credit hours earned between 9/1/2018 and 12/31/2019	15.143	18.968	9.419	0.124	–2.933	–0.039	–3.499	–0.046	155
	(46.806)	(75.882)	(16.463)		(13.340)		(15.076)		
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	42.458	32.229	15.906	0.534	20.065†	0.673	–6.807	–0.228	155
	(48.034)	(29.797)	(13.200)		(10.263)		(7.905)		
Workplace retention	0.813	0.855	–0.146	–0.413	0.026	0.072	–0.184†	–0.519	151
	(0.392)	(0.354)	(0.117)		(0.071)		(0.099)		
			Primary language: English		Primary language: Non-English				
Increased at least one step in the career lattice since 9/1/2018	0.195	0.179	0.063	0.163	–0.123	–0.317	na	na	155
	(0.399)	(0.386)	(0.071)		(0.139)				
College credit hours earned between 9/1/2018 and 12/31/2019	15.143	18.968	7.671	0.101	–33.149	–0.437	na	na	155
	(46.806)	(75.882)	(9.999)		(37.358)				
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	42.458	32.229	12.048	0.404	23.128	0.776	na	na	155
	(48.034)	(29.797)	(7.927)		(16.814)				
Workplace retention	0.813	0.855	–0.067	–0.188	–0.028	–0.078	na	na	151
	(0.392)	(0.354)	(0.068)		(0.160)				

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Group 1 Estimated impact[a] (standard error[b])	Group 1 Effect size[c]	Group 2 Estimated impact[a] (standard error[b])	Group 2 Effect size[c]	Group 3 Estimated impact[a] (standard error[b])	Group 3 Effect size[c]	Sample size[d]
			Workplace role: Director/Owner		Workplace role: Lead Teacher/Teacher		Workplace role: Aide/Other		
Increased at least one step in the career lattice since 9/1/2018	0.195	0.179	0.054	0.139	0.113	0.294	–0.009	–0.023	155
	(0.399)	(0.386)	(0.089)		(0.096)		(0.107)		
College credit hours earned between 9/1/2018 and 12/31/2019	15.143	18.968	15.253	0.201	0.311	0.004	–16.541	–0.218	155
	(46.806)	(75.882)	(11.211)		(12.962)		(25.571)		
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	42.458	32.229	12.200	0.409	18.340	0.616	12.661	0.425	155
	(48.034)	(29.797)	(11.777)		(11.654)		(12.897)		
Workplace retention	0.813	0.855	–0.019	–0.053	–0.103	–0.291	–0.138	–0.390	151
	(0.392)	(0.354)	(0.072)		(0.110)		(0.125)		
			Education level: associate degree or higher		Education level: below associate degree				
Increased at least one step in the career lattice since 9/1/2018	0.195	0.187	0.002	0.004	0.047	0.120	na	na	152
	(0.399)	(0.392)	(0.093)		(0.074)				
College credit hours earned between 9/1/2018 and 12/31/2019	15.143	19.727	10.911	0.141	–5.739	–0.074	na	na	152
	(46.806)	(77.307)	(13.409)		(14.199)				
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	42.458	32.218	7.852	0.260	15.986†	0.528	na	na	152
	(48.034)	(30.254)	(8.629)		(8.414)				
Workplace retention	0.813	0.849	–0.053	–0.148	–0.057	–0.158	na	na	148
	(0.392)	(0.360)	(0.097)		(0.071)				

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Group 1 Estimated impact[a] (standard error[b])	Group 1 Effect size[c]	Group 2 Estimated impact[a] (standard error[b])	Group 2 Effect size[c]	Group 3 Estimated impact[a] (standard error[b])	Group 3 Effect size[c]	Sample size[d]
			Race/ethnicity: White		Race/ethnicity: Other than White				
Increased at least one step in the career lattice since 9/1/2018	0.195	0.187	0.070	0.179	–0.069	–0.176	na	na	152
	(0.399)	(0.392)	(0.076)		(0.092)				
College credit hours earned between 9/1/2018 and 12/31/2019	15.143	19.727	10.981	0.142	–20.925	–0.271	na	na	152
	(46.806)	(77.307)	(10.755)		(16.400)				
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	42.458	31.328	16.166†	0.557	9.268	0.320	na	na	152
	(48.034)	(28.998)	(9.142)		(8.694)				
Workplace retention	0.813	0.851	–0.003	–0.008	–0.126	–0.352	na	na	149
	(0.392)	(0.358)	(0.062)		(0.110)				
			Workplace type: Home-based care		Workplace type: Not home-based care				
Increased at least one step in the career lattice since 9/1/2018	0.200	0.167	0.082	0.218	0.034	0.090	na	na	142
	(0.403)	(0.375)	(0.115)		(0.071)				
College credit hours earned between 9/1/2018 and 12/31/2019	16.657	19.160	13.812	0.176	–4.335	–0.055	na	na	142
	(48.861)	(78.274)	(12.430)		(15.014)				
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	43.564	32.998	16.273	0.529	13.572	0.441	na	na	142
	(49.298)	(30.752)	(12.777)		(8.560)				
Workplace retention	0.797	0.857	–0.001	–0.002	–0.107	–0.303	na	na	139
	(0.405)	(0.352)	(0.080)		(0.079)				

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Group 1 Estimated impact[a] (standard error[b])	Group 1 Effect size[c]	Group 2 Estimated impact[a] (standard error[b])	Group 2 Effect size[c]	Group 3 Estimated impact[a] (standard error[b])	Group 3 Effect size[c]	Sample size[d]
			Lives in an urban area		Lives in a rural area				
Increased at least one step in the career lattice since 9/1/2018	0.195	0.179	0.029	0.075	0.033	0.085	na	na	155
	(0.399)	(0.386)	(0.073)		(0.095)				
College credit hours earned between 9/1/2018 and 12/31/2019	15.143	18.968	–5.361	–0.071	14.240	0.188	na	na	155
	(46.806)	(75.882)	(11.543)		(15.359)				
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	42.458	32.229	10.584	0.355	22.260*	0.747	na	na	155
	(48.034)	(29.797)	(9.237)		(11.115)				
Workplace retention	0.813	0.855	–0.107	–0.302	0.054	0.152	na	na	151
	(0.392)	(0.354)	(0.073)		(0.078)				
			Distance to college: less than 5 miles		Distance to college: 5–20 miles		Distance to college: more than 20 miles		
Increased at least one step in the career lattice since 9/1/2018	0.189	0.189	0.036	0.091	–0.015	–0.037	0.125	0.316	148
	(0.394)	(0.394)	(0.080)		(0.094)		(0.181)		
College credit hours earned between 9/1/2018 and 12/31/2019	15.757	19.993	10.785	0.139	–2.690	–0.035	–29.202	–0.375	148
	(47.655)	(77.800)	(12.184)		(13.771)		(31.805)		
Total community-based training hours recorded between 9/1/2018 and 12/31/2019	42.949	31.414	7.160	0.242	20.630	0.697	33.516†	1.133	148
	(48.591)	(29.592)	(7.654)		(13.550)		(17.949)		
Workplace retention	0.806	0.861	–0.157*	–0.451	0.025	0.072	–0.098	–0.280	144
	(0.399)	(0.348)	(0.077)		(0.091)		(0.152)		

† Significant at $p < .10$; * significant at $p < .05$.
na is not applicable.
Note: None of the effects was statistically significant at $p < .01$.
a. Estimated using a linear probability model with an indicator for treatment.
b. Adjusted using randomization inference tests to account for the use of rerandomization. See appendix B for a description of how standard errors were estimated.
c. Calculated by dividing the estimated impact by the standard deviation of the outcome for the control group.
d. Refers to the sample size for the regression analysis and includes both treatment and control group participants that who had data for the outcome.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Table C6. The impact of the monetary incentive emails on increase in identification as a professional and motivation to take a college course or earn a degree during the study period, 2018 and 2019

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Estimated impact[a] (standard error[b])	Effect size[c]	Sample size[d]
Increase in identification as a professional	0.184	0.162	0.066	0.175	86
	(0.391)	(0.374)	(0.088)		
Motivation to take a college course in the next year	0.481	0.308	0.083	0.177	91
	(0.505)	(0.468)	(0.098)		
Motivation to take a college course in the next five years	0.442	0.410	0.050	0.101	91
	(0.502)	(0.498)	(0.121)		
Motivation to earn a degree in the next five years	0.404	0.436	–0.001	–0.002	91
	(0.495)	(0.502)	(0.109)		

Note: Motivation outcomes were measured as whether respondents reported high or very high motivation. None of the effects was statistically significant at $p < .10$.
a. Estimated using a linear probability model with an indicator for treatment.
b. Adjusted using randomization inference tests to account for the use of rerandomization. See appendix B for a description of how standard errors were estimated.
c. Calculated by dividing the estimated impact by the standard deviation of the outcome for the control group.
d. Refers to the sample size for the regression analysis and includes both treatment and control group participants who had data for the outcome.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Incentive randomization automatic scholarship enrollment emails, additional analyses

The tables below show the treatment-on-the-treated estimates (table C7), the group analyses for the automatic scholarship enrollment emails (table C8), and the secondary outcomes (table C9).

Table C7. Treatment-on-the-treated estimates of the automatic scholarship enrollment emails on scholarship use, career lattice movement, college credit hours earned, and workplace retention during the study period, 2018 and 2019

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Estimated impact[a] (standard error[b])	Effect size[c]	Sample size[d]
Used a community college scholarship	0.063	0.026	0.119	0.748	158
	(0.244)	(0.159)	(0.125)		
Increased at least one step in the career lattice since 9/1/2018	0.100	0.179	–0.325	–0.842	158
	(0.302)	(0.386)	(0.225)		
College credit hours earned between 9/1/2018 and 12/31/2019	16.038	18.968	–9.680	–0.128	158
	(41.755)	(75.882)	(30.757)		
Workplace retention	0.838	0.855	0.056	0.157	156
	(0.371)	(0.354)	(0.215)		

Note: None of the effects was statistically significant at $p < .10$.
a. Estimated using a linear probability model with an indicator for treatment.
b. Estimated impact were adjusted using randomization inference tests to account for the use of rerandomization. See appendix B for a description of how standard errors were estimated.
c. Calculated by dividing the estimated impact by the standard deviation of the outcome for the control group.
d. Refers to the sample size for the regression analysis and includes both treatment and control group participants who had data for the outcome.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Scholarship emails had a differential impact on career lattice movement for some groups but not on scholarship use, college credit hours earned, or workplace retention. The scholarship emails did not have a detected differential impact by groups of participants defined by age ranges, primary language, education levels, race/ethnicity, type of workplace, workplace roles, workplace type, urban or rural location, or distance to the closest in-state public college or university on scholarship use, college credit hours, or workplace retention, but they did have an impact on career lattice movement (table C8). Treated participants who identified English as their primary language, had an education level below associate degree, or lived in an urban area were less likely to move up a step than the control group (by 12, 11, and 12 percentage points, respectively). Treated participants who were younger than age 35 or who were age 55 or older at baseline were less likely to increase a career lattice step than control participants in those groups (by 13 and 20 percentage points, respectively). For distance to college, treated participants who lived 5–20 miles from the nearest public in-state college were less likely to increase at least one step compared with the control group (by 13 percentage points). Again, adjusting for the large number of comparisons eliminated the statistical significance of these differences.

Table C8. Group analyses of the impact of the automatic scholarship enrollment emails on main outcomes during the study period, 2018 and 2019

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Group 1 Estimated impact[a] (standard error[b])	Group 1 Effect size[c]	Group 2 Estimated impact[a] (standard error[b])	Group 2 Effect size[c]	Group 3 Estimated impact[a] (standard error[b])	Group 3 Effect size[c]	Sample size[d]
			Age group: younger than 35		Age group: 35–54		Age group: 55 and older		
Used a community college scholarship	0.063	0.026	0.033	0.207	0.002	0.013	0.143	0.902	158
	(0.244)	(0.159)	(0.052)		(0.045)		(0.100)		
Increased at least one step in the career lattice since 9/1/2018	0.100	0.179	–0.132†	–0.342	–0.026	–0.067	–0.198*	–0.513	158
	(0.302)	(0.386)	(0.071)		(0.074)		(0.085)		
College credit hours earned between 9/1/2018 and 12/31/2019	16.038	18.968	8.746	0.115	–9.399	–0.124	–4.146	–0.055	158
	(41.755)	(75.882)	(11.357)		(11.936)		(12.057)		
Workplace retention	0.838	0.855	–0.019	–0.052	0.060	0.170	–0.088	–0.248	156
	(0.371)	(0.354)	(0.100)		(0.076)		(0.127)		
			Primary language: English		Primary language: Non-English				
Used a community college scholarship	0.063	0.026	0.027	0.170	0.048	0.301	na	na	158
	(0.244)	(0.159)	(0.034)		(0.107)				
Increased at least one step in the career lattice since 9/1/2018	0.100	0.179	–0.122*	–0.315	0.087	0.226	na	na	158
	(0.302)	(0.386)	(0.060)		(0.155)				
College credit hours earned between 9/1/2018 and 12/31/2019	16.038	18.968	4.436	0.058	–34.253	–0.451	na	na	158
	(41.755)	(75.882)	(7.834)		(27.600)				
Workplace retention	0.838	0.855	–0.008	–0.022	0.116	0.326	na	na	156
	(0.371)	(0.354)	(0.066)		(0.133)				

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Group 1 Estimated impact[a] (standard error[b])	Group 1 Effect size[c]	Group 2 Estimated impact[a] (standard error[b])	Group 2 Effect size[c]	Group 3 Estimated impact[a] (standard error[b])	Group 3 Effect size[c]	Sample size[d]
			Workplace role: Director/Owner		Workplace role: Lead Teacher/Teacher		Workplace role: Aide/Other		
Used a community college scholarship	0.063	0.026	0.003	0.020	0.051	0.323	0.068	0.425	158
	(0.244)	(0.159)	(0.058)		(0.054)		(0.088)		
Increased at least one step in the career lattice since 9/1/2018	0.100	0.179	–0.123	–0.318	0.028	0.072	–0.113	–0.292	158
	(0.302)	(0.386)	(0.088)		(0.083)		(0.073)		
College credit hours earned between 9/1/2018 and 12/31/2019	16.038	18.968	–4.106	–0.054	–9.838	–0.130	12.821	0.169	158
	(41.755)	(75.882)	(14.613)		(10.145)		(14.728)		
Workplace retention	0.838	0.855	0.085	0.240	–0.044	–0.124	0.018	0.050	156
	(0.371)	(0.354)	(0.093)		(0.089)		(0.119)		
			Education level: associate degree or higher		Education level: below associate degree				
Used a community college scholarship	0.063	0.027	0.069	0.428	0.013	0.078	na	na	155
	(0.244)	(0.162)	(0.062)		(0.038)				
Increased at least one step in the career lattice since 9/1/2018	0.100	0.187	–0.029	–0.075	–0.111†	–0.282	na	na	155
	(0.302)	(0.392)	(0.085)		(0.065)				
College credit hours earned between 9/1/2018 and 12/31/2019	16.038	19.727	5.462	0.071	–7.023	–0.091	na	na	155
	(41.755)	(77.307)	(10.669)		(12.232)				
Workplace retention	0.838	0.849	–0.018	–0.050	0.040	0.112	na	na	153
	(0.371)	(0.360)	(0.093)		(0.071)				

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Group 1 Estimated impact[a] (standard error[b])	Group 1 Effect size[c]	Group 2 Estimated impact[a] (standard error[b])	Group 2 Effect size[c]	Group 3 Estimated impact[a] (standard error[b])	Group 3 Effect size[c]	Sample size[d]
			Race/ethnicity: White		Race/ethnicity: Other than White				
Used a community college scholarship	0.064	0.027	0.025	0.156	0.030	0.185	na	na	153
	(0.247)	(0.162)	(0.040)		(0.062)				
Increased at least one step in the career lattice since 9/1/2018	0.103	0.187	–0.101	–0.257	–0.056	–0.142	na	na	153
	(0.305)	(0.392)	(0.066)		(0.090)				
College credit hours earned between 9/1/2018 and 12/31/2019	16.449	19.727	7.085	0.092	–21.614	–0.280	na	na	153
	(42.212)	(77.307)	(9.416)		(13.771)				
Workplace retention	0.833	0.851	0.016	0.045	0.024	0.067	na	na	152
	(0.375)	(0.358)	(0.073)		(0.098)				
			Workplace type: Home-based care		Workplace type: Not home-based care				
Used a community college scholarship	0.068	0.028	0.026	0.155	0.038	0.232	na	na	146
	(0.253)	(0.165)	(0.056)		(0.047)				
Increased at least one step in the career lattice since 9/1/2018	0.108	0.167	–0.116	–0.310	–0.018	–0.049	na	na	146
	(0.313)	(0.375)	(0.087)		(0.066)				
College credit hours earned between 9/1/2018 and 12/31/2019	13.446	19.16	–2.731	–0.035	–4.490	–0.057	na	na	146
	(34.985)	(78.274)	(15.007)		(8.888)				
Workplace retention	0.851	0.857	0.066	0.188	–0.017	–0.049	na	na	144
	(0.358)	(0.352)	(0.087)		(0.077)				

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Group 1 Estimated impact[a] (standard error[b])	Group 1 Effect size[c]	Group 2 Estimated impact[a] (standard error[b])	Group 2 Effect size[c]	Group 3 Estimated impact[a] (standard error[b])	Group 3 Effect size[c]	Sample size[d]
			Lives in an urban area		Lives in a rural area				
Used a community college scholarship	0.063	0.026	0.003	0.016	0.103	0.650	na	na	158
	(0.244)	(0.159)	(0.035)		(0.068)				
Increased at least one step in the career lattice since 9/1/2018	0.100	0.179	–0.117†	–0.304	0.001	0.001	na	na	158
	(0.302)	(0.386)	(0.063)		(0.100)				
College credit hours between 9/1/2018 and 12/31/2019	16.038	18.968	–1.063	–0.014	–6.226	–0.082	na	na	158
	(41.755)	(75.882)	(9.217)		(14.642)				
Retention	0.838	0.855	0.023	0.065	–0.007	–0.020	na	na	156
	(0.371)	(0.354)	(0.070)		(0.094)				
			Distance to college: less than 5 miles		Distance to college: 5–20 miles		Distance to college: more than 20 miles		
Used a community college scholarship	0.063	0.027	0.041	0.251	0.029	0.179	–0.018	–0.110	153
	(0.245)	(0.163)	(0.051)		(0.046)		(0.060)		
Increased at least one step in the career lattice since 9/1/2018	0.089	0.189	–0.053	–0.133	–0.132*	–0.335	–0.139	–0.352	153
	(0.286)	(0.394)	(0.081)		(0.063)		(0.150)		
College credit hours between 9/1/2018 and 12/31/2019	16.241	19.993	2.152	0.028	–8.461	–0.109	7.685	0.099	153
	(41.982)	(77.800)	(10.048)		(8.664)		(42.459)		
Retention	0.835	0.861	0.001	0.004	–0.045	–0.129	0.216	0.619	151
	(0.373)	(0.348)	(0.079)		(0.080)		(0.130)		

† Significant at $p < .10$; * significant at $p < .05$.
na is not applicable.
Note: None of the effects was statistically significant at $p < .01$.
a. Estimated using a linear probability model with an indicator for treatment.
b. Adjusted using randomization inference tests to account for the use of rerandomization. See appendix B for a description of how standard errors were estimated.
c. Calculated by dividing the estimated impact by the standard deviation of the outcome for the control group.
d. Refers to the sample size for the regression analysis and includes both treatment and control group participants who had data for the outcome.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Table C9. The impact of automatic scholarship enrollment emails on increase in identification as a professional, motivation to take a college course in the next year and the next five years, and motivation to earn a degree in the next five years during the study period, 2018 and 2019

Outcome	Treatment group mean (standard deviation)	Control group mean (standard deviation)	Estimated impact[a] (standard error[b])	Effect size[c]	Sample size[d]
Increase in identification as a professional	0.018	0.162	–0.105	–0.281	81
	(0.390)	(0.374)	(0.103)		
Motivation to take a college course in the next year	0.542	0.308	0.319**	0.683	87
	(0.504)	(0.468)	(0.119)		
Motivation to take a college course in the next five years	0.542	0.410	0.201†	0.403	87
	(0.504)	(0.498)	(0.109)		
Motivation to earn a degree in the next five years	0.563	0.436	0.191†	0.380	87
	(0.501)	(0.502)	(0.105)		

† Significant at $p < .10$; ** significant at $p < .01$.
a. Estimated using a linear probability model with an indicator for treatment.
b. Standard errors for the estimated impact were adjusted using randomization inference tests to account for the use of rerandomization. See appendix B for a description of how standard errors were estimated.
c. Calculated by dividing the estimated impact by the standard deviation of the outcome for the control group.
d. Refers to the sample size for the regression analysis and includes both treatment and control group participants who had data for the outcome.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2018 and 2019.

Survey results: Additional analyses and findings

This section reports descriptive findings from the participant surveys, which provide additional context about treatment group participants' perceived receipt of and responses to the intervention emails. This is followed by general survey questions about factors motivating professional development among early childhood education workforce members. Findings from responses to the follow-up surveys for each intervention should be viewed with caution because of small sample sizes among the treatment group respondents and uncertainty whether respondents accurately represent the original study sample. The study team was unable to conduct a nonresponse bias analysis because few background characteristics were correlated with outcomes; thus, the study team could not diagnose the extent of nonresponse bias.

Small numbers of respondents indicated that the email information motivated behavior change. Among a very small number of treatment group participants responding to follow-up survey questions (about 20–50 percent of respondents depending on the treatment group—only a small number of respondents were eligible to answer this question on the survey), 50–80 percent reported that the email they received motivated them to sign up for the career lattice, complete training hours or college coursework, or access the scholarship they had been enrolled in. This tentatively suggests that that the emails motivated some recipients in positive ways, although those impacts were not detected statistically.

Small numbers of survey respondents indicated that a lack of information, qualifying educational activities, and time were reasons for not signing up for the career lattice or applying for an education award or accessing the scholarship. Among the small number of participants in the sign-up randomization treatment group who responded to a follow-up survey question on why they did not sign up for the career lattice (approximately 40 percent of the treatment group respondents), the most common reason for not signing up for the career lattice was not being sure how to sign up (less than 50 percent of respondents mentioned this), followed by not knowing

about the steps program. This provides suggestive evidence that some participants in the sign-up treatment group might not have read the emails.

Some survey respondents from the incentive randomization reported that they did not apply for an education award or access the scholarship because of a lack of qualifying professional development activities, plans to pursue college courses, or a lack of time. Among the few treatment group participants in the incentive randomization who responded to follow-up survey questions (30–60 percent of respondents depending on the treatment group), the most common reason given for not applying for an education award or accessing a scholarship was not qualifying for an education award during the study period (less than 50 percent of respondents) or not having time to take college courses (about 60 percent).

Among respondents in the sign-up randomization treatment group who said they signed up for the career lattice, a majority indicated that they did so to be recognized for their education achievements, to plan for professional development, and because their employer required it. Among a small number of respondents in the incentive randomization treatment groups (50–80 percent of participants depending on the group), the majority indicated that education awards and scholarships offered through Oregon Center for Career Development in Childhood Care and Education (OCCD) motivated them to a moderate or large extent to continue education or training.

Follow-up survey respondents reported mixed recollections of receiving the emails. Many treatment group participants across interventions reported that they either did not receive or did not know if they received an email about signing up for the career lattice, monetary education award information, or automatic scholarship enrollment (depending on intervention group). However, these findings should be interpreted with caution due to the small sample sizes in each group. Less than half the sign-up treatment group (44 percent) and the automatic scholarship enrollment treatment group (35 percent) reported in the follow-up survey that they had received an email about their respective interventions from OCCD (table C10). About half (53 percent) of the monetary incentive treatment group who responded to the follow-up survey reported receiving the email. This implies that although administrative records indicate participants opened the email, many recipients did not recall the email or the content that was specific to this study. Participants might not have read or fully engaged with email content as intended through the intervention, which could in turn help explain the null findings of the study.

Table C10. Follow-up survey responses by randomized treatment group regarding receipt of an intervention email, 2019 (percent)

Survey question response	Sign-up randomization treatment group (*n* = 55)	Incentive randomization monetary incentive treatment group (*n* = 51)	Incentive randomization automatic scholarship enrollment treatment group (*n* = 48)
Yes, received an email about the intervention from OCCD since August 2018	44	53	35
No, did not receive an email about the intervention from OCCD	29	47[a]	25
Don't know if received an email about the intervention from OCCD	27		40

OCCD is Oregon Center for Career Development in Childhood Care and Education.
a. Results were combined to protect respondent privacy due to small respondent numbers.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2019.

A majority of survey respondents at baseline reported that they planned to continue their formal education and planned to participate in non-credit-bearing professional development (table C11). Additionally, most respondents in the incentive randomization reported at least a moderate level of motivation to take a college course or earn a degree in the near future. More respondents reported a high or very high level of motivation to take a college course in the next five years compared with the next year, indicating that the timeline for planning to return to college is likely closer to five years than one year for many respondents.

Table C11. Baseline survey responses by randomized trial regarding continuing education or professional development, 2018 (percent)

Survey question and response	Sign-up randomization (*n* = 245)	Incentive randomization (*n* = 207)
Plan to continue formal education	(*n* = 244)	(*n* = 207)
Yes	59	62
No	14	13
Don't know	27	26
Plan to participate in professional development for which will not receive college course credit	(*n* = 245)	(*n* = 207)
Yes	59	76
No	14	8
Don't know	27	16
Level of motivation to take a college course in the next year	na	(*n* = 193)
Very low		15
Low		10
Moderate		33
High		19
Very high		23
Level of motivation to take a college course in the next five years	na	(*n* = 192)
Very low		13
Low		8
Moderate		29
High		24
Very high		26
Level of motivation to earn a higher education degree or early childhood education-related certification in the next five years	na	(*n* = 193)
Very low		13
Low		9
Moderate		24
High		23
Very high		31

na is not applicable because the question was not asked of the sign-up randomization participants.
Note: Percentages might not sum to 100 because of rounding.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2019.

Most participants (more than 80 percent in both trials) reported at baseline that personal growth was a motivation to continue their education and training (table C12). Getting a job was a motivator for more participants in the sign-up randomization (27 percent) than in the incentive randomization (12 percent), whereas licensing or workplace requirements were noted as motivators for more participants in the incentive randomization (more than half) than in the sign-up randomization (less than half). Fewer respondents (11 percent for sign-up and 23 percent for incentive) reported that scholarship money was a motivator.

Table C12. Baseline survey responses by randomization trial regarding motivating factors to continue education and training, 2018 (percent)

Survey question and response	Sign-up randomization (*n* = 198)	Incentive randomization (*n* = 188)
What motivates you to continue your education and training?		
Personal growth	88	84
Meet Office of Child Care licensing requirements	46	66
My workplace requires me to continue education and training	46	52
Receive a promotion/pay raise	35	42
Get a job	27	12
Scholarship money	11	23
Spark requirements[a]	6	22
Other	9	10

Note: Respondents could select multiple responses.
a. Spark refers to Oregon's quality rating and improvement system.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2019.

More than half (56 percent) of incentive randomization participants responding to the baseline survey question about factors affecting their decision to continue their education ranked cost as the most important factor and 82 percent ranked it as one of their top three factors (table C13). Time was the second most highly ranked factor, followed by family commitments. Distance was ranked in the top three factors for about a quarter (27 percent) of participants.

Table C13. Baseline survey responses for incentive randomization participants regarding the most important factors affecting the decision to continue education, 2018 (percent)

Survey question and response	Ranked 1 (*n* = 188)	Ranked 1 or 2 (*n* = 188)	Ranked 1, 2, or 3 (*n* = 188)
What factors affect your decision to continue your education? (Responses ranked with the most important factor ranked first; not all options had to be ranked)			
Cost	56	71	82
Time	27	61	81
Family commitments	8	29	51
Distance	1	15	27
Language barrier	4	9	12
Difficulty of subject matter	1	3	8
Other	4	5	7

Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2019.

Among the participants responding to the follow-up survey questions, about half across both the sign-up and incentive randomizations believed that a step in the career lattice helped them a lot to feel more professional or to plan for their professional development, and 9–15 percent felt it did not help at all (table C14). About 34–38 percent indicated that a step helped them connect with others a lot, and 29–41 percent felt it did not help them connect with others at all.

Table C14. Follow-up survey responses by randomization trial regarding benefits of having a step, 2019 (percent)

Survey question and response	Sign-up randomization (*n* = 33)	Incentive randomization (*n* = 137)
How much has a step on the Oregon Registry helped you feel more professional?	*n* = 32	*n* = 137
Helped a lot	44	53
Helped a little	47	32
Did not help at all	9	15
How much has a step on the Oregon Registry helped you plan your professional development?	*n* = 33	*n* = 135
Helped a lot	45	49
Helped a little	40	36
Did not help at all	15	15
How much has a step on the Oregon Registry helped you connect to others who care about children and families?	*n* = 32	*n* = 136
Helped a lot	38	34
Helped a little	22	38
Did not help at all	41	29

Note: The sign-up randomization sample is small because only those who said they had registered for the career lattice were asked these questions. Percentages might not sum to 100 because of rounding.
Source: Authors' analysis of Oregon Center for Career Development in Childhood Care and Education data from 2019.