

INTERPRETATIVE REPERTOIRES FOR TALKING (ABOUT) SCIENCE-RELATED CAREERS

One of the main objectives of many science educators is to enroll students into science majors and careers, that is, to get students into what scientists call “the science pipeline.” Past research has investigated students’ views of science in terms of factors and influences that guide students to choose science as a career. However, few investigations exist that have studied the forms of language culture makes available for articulating possible careers generally or the ways of grounding (justifying) these possibilities particularly. In this chapter, we investigate ways of using language for supporting justifications of career choices in interview situations. We draw on discursive psychology as theory and method to identify four *interpretative repertoires* that are deployed during the interviews: the (a) formative, (b) performative, (c) consequent, and (d) potential repertoires. These interpretative repertoires do not merely characterize the discourse about different science-related professions but in fact co-articulate different science-related identities.

DISCURSIVE RESOURCES IN CAREER DISCOURSE

Researchers and public policymakers have expressed concerns about the lack of interest and participation in science among high school students. Natural scientists are so concerned with “filling the pipeline” that flagship journals such as *Science* regularly feature articles about getting more students to enroll in science and have entire sections devoted to career-related issues (“Focus on Careers”). Yet it is widely known that many adolescents, and particularly female and minority students, choose not to pursue careers in mathematics, science, and technology. Therefore, to better understand students’ rationales of their choices and decision-making for pursuing careers has become an important and urgent topic in science education. As a result, studies have been designed to identify the critical factors and influences on students’ science career aspirations and identities. For instance, we may find research that articulates apparent key components including (a) students’ self-efficacy, interest and motivations; (b) ethnic identity, academic achievements, and socioeconomic status; (c) educational outcomes, instructional quantity, and home environment; (d) the role of social encouragement for students’ science motivation and confidence; (e) the influence of informal science programs on career decisions; (f) the effect of percent female faculty on students’ science identities; (g) the view of the nature of science and support for deep-seated life goals; and (h) gender differences and correlations in students’ science-related interests, attitudes and experiences.

In this chapter, we introduce a different approach from that which is usually taken to career aspirations. Rather than assuming that there is something characteristic in and of individual students, we presuppose consistent with our discursive

psychological approach that the discourse students mobilize forms of talk about topics that are cultural and therefore constitute a widely shared collective phenomenon. It is because the discourse is shared that interviewer and interviewees can understand each other while talking and talking about career and life choices. Precisely because the available language and topics are already intelligible, what students and researchers can say and do say in an interview is not at all singular. Rather, language generally and the interpretative repertoires (i.e., unchallenged forms of language use) specifically provide students and researchers with specific resources on how they can talk and what they can talk about. In contrast to most research, we are less interested in what factors or attitudes affect students' career aspirations. We are more interested in how language is deployed to produce these factors and attitudes as an effect and how it is used to articulate and relate to possible careers. That is, our study aims to identify the language resources of interpretative repertoires that are shared and mobilized in the career choice discourse. Underlying our research is the supposition that any higher psychological function is and has been a soci(et)al relation (Vygotskian, 1978). Accordingly, we take a relatively recent approach consistent with this supposition—discursive psychology—as our method and theory. Utilizing this conceptual framework, we analyze the discourse deployed in an interview situation involving an academic researcher and high school biology students. We identify interpretative repertoires—the shared discursive resources—to better understand aspects of science-related careers and identity talk as the participants explored possible science-related careers.

In this chapter, we are concerned with cultural resources for articulating science-related career choices and identities exhibited and mobilized in interviews with high school students. Because the discourse of career choices is at the heart of how someone comes to be described and how the possible futures can be envisioned, investigating the discourse allows us to understand the connection and relationship between students and science. In the introduction to this book, we already introduce discursive psychology (our theory and method) and interpretative repertoires (a core concept in discursive psychology). In the following, we briefly outline some recent work concerning science education and identity.

Identity—who we are for ourselves and who we are in relation to others—is a complex phenomenon, and seems to have a core that undergoes developments when we articulate ourselves. The science education literature over the past decade has shown that identity is increasingly becoming one of the core issues in the study of knowing and learning generally and in science education more specifically (Roth & Tobin, 2006). Importantly, how students engage in science is influenced by how students view themselves with respect to science. Thus, studying the topic of identity in science discourse where includes students' voices provides us an avenue to understand the relationship between science and students.

In this study, we are interested in how discursive resources are mobilized for co-articulating science-related identities. We take identity as a phenomenon that arises from social interactions. Thus, as shown in chapter 2, a research interview becomes not just an elicitation of information but also a site of co-production, management, and presentation of identities. For instance, in what turned out to be the first study

of interpretative repertoires, scientists' discourse exhibited their identities as objective and impartial people through the empiricist repertoire and as social beings through the contingent repertoire, which they used to articulate the personal and societal influences on the research process and research results (Gilbert & Mulkey, 1984). Following this approach, we identify in this chapter the interpretative repertoires in students' science-related career discourse to understand aspects of science-related identities as available from their discourse. Here, identity provides a lens through which individuals reason about the world and their roles in it, but at the same time, this reasoning provides a resource to produce and reproduce identity. That is, students' identities in this study are produced and reproduced in and through talk-in-interaction in an interview situation. How students reason about the relationship between themselves and possible science-related careers—how students draw on interpretative repertoires (cultural resources) to articulate their possible careers—provides a site for understanding aspects of science-related identities exhibited but not necessarily consciously attended to in such discourse. Because of the shared nature of interpretive repertoires, students concretely realize cultural possibilities so that their talk reveals not merely a singular identity but a form of identity available to members of this culture.

INTERPRETATIVE REPERTOIRES FOR TALKING ABOUT PREFERRED AND DISPREFERRED SCIENCE-RELATED CAREERS

In this chapter, we aim at articulating the opportunities that discourse provides young adults to talk about career choices in student–researcher interviews generally and the science-related identities exhibited in such discourse in particular. Drawing on discursive psychology as theory and method, we identify four salient interpretative repertoires used in the interview discourse when students talk about career options. Each of these interpretative repertoires presents a linguistic resource for (dis-)identifying with science-related careers (See Table 3.1). These interpretative repertoires pertain to the (a) formative, (b) performative, (c) consequent, and (d) potential dimensions of actions. These interpretative repertoires can be thought as cultural resources or as a toolbox with different compartments or a tote tray from which participants draw on for their conversations. The resulting discourse therefore has properties that do not belong to individuals but to the culture and are merely realized in a concrete manner by individuals. These interpretative repertoires can serve as both possibilities and constraints in the interview discourse. Possibilities exist in the sense that participants can freely and without reflecting draw on these intelligible and cultural possibilities to assist in their articulations; and constraints exist in a sense that only certain forms of language (e.g., interpretative repertoires) can be used without the threat of being challenged. In the following sections, we demonstrate how these cultural tools were mobilized for articulating career choices in interviews. Each of these interpretative repertoires is described and illustrated with different examples in terms of (dis-)identifying with various careers. With the identification information, we further discuss how science-related identities were co-articulated and exhibited in such discourse.

Formation and Preparation for Becoming

The formative repertoire constitutes discourse about formations, special characteristics or requirements for becoming a vocational agent. If we look at the example of being a scientist, this vocation is normally associated with being smart, professional, and special and specialized. It is noted that someone needs to undergo a lot of schooling before being a scientist. These required characteristics or processes become discursive resources to articulate careers in the discourse. In this section, we demonstrate how this kind of resource—the formative repertoire is mobilized in our database to reason and (dis-)identify with possible career options. We exhibit five excerpts (two identifying and four dis-identifying) to demonstrate the use of the formative repertoire in the interview situations.

In the following excerpt, we make available a conversation that occurred after Mandy wrote down “specialized doctor” as her preferred career and “clinical doctor” as a disliked career. When asked for justifications for the choice of “specialized doctor,” the character of specialized personnel—“focus in on one thing” and “master”—the trait of being a specialized doctor is utilized as a resource in an for a response.

Interviewer: so number three is?
Mandy: specialized doctor, i guess i (.) just am:: uhm you could focus in on one thing, and you could really kind of MASTER that and be able to open something, i am not sure exactly what the would be (.) yet, but something more specialized rather than just like a clinical doctor ((points to the “clinical doctor” card))
Interviewer: so do you discuss this with your friends or family before?

The excerpt shows that not any form of doctor constitutes a possible career but a specialized one. Specialty becomes the central feature for justifying this choice as if specialty is something attached to that particular career. That is, the characteristic of being specialized is a resource, one form of the formative repertoire, mobilized in the conversation to legitimize the choice of being a doctor. In the next excerpt, Elise also draws on the formative repertoire to articulate one of her career choices—psychologist.

Interviewer: so how about this one ((points to the “psychologist” card)), psychologist?
Elise: psychologist, uhm:: i think psychology is SO interesting (...continue...) i love just learning about that, because in order to do this sort of a job(.) or anything, to succeed in any type of job, you have to be, like you have to understand psychology because(.) like if you are a lawyer or a message therapist, you have to learn how to communicate

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with people and understand like (.) when it is right to say what (.) and what to say (.) and you know just generally it is just a really good thing to know, it is a good course or if you can get a degree in that (.)it is really good

Interviewer: like a necessary (.) a course you have to do.
Elise: yeah

In response to the question of being a psychologist, Elise quickly relates to the subject of “psychology”—a subject needed to be studied before being a psychologist. The advantage of learning psychology to other occupations “lawyer” and “message therapist” is connected, as learning psychology is a way to many successful careers. She also describes how she enjoys learning about the subject of psychology “psychology is so interesting,” “it (psychology) is a good course.” As the interviewer’s comment “like a necessary a course you have to do” suggests, we can hear the conversation as emphasizing the importance and benefits of taking psychology courses—these formation processes before being a psychologist become a salient resource that allow Elise to identify with a possible career.

The same interpretative repertoires can be used to make opposing claims. This is the case in the present data sources when students draw on these discursive resources to dis-identify with certain career options. In the following excerpt, we show how the formative repertoire can be used as a resource to dis-identify with some careers including surgeon, general practitioner, or pediatrician by relating to the schooling requirement.

Kelly: because if i want to become any of these other things ((point to the surgeon, general practitioner, pediatrician cards)), i have to go to school for at least seven years (.) so that is holding me back too
Interviewer: so you mean when you graduate from high school, you can be a personal trainer?
Kelly: yeah, i can pretty much go into that (.) easy
Interviewer: okay

“Personal trainer” is Kelly’s favorite career that is then compared to other positively marked careers (surgeon, general practitioner, pediatrician). Although being a doctor is one of her favorite careers, the years of schooling—the time demands for becoming a doctor is an issue that “holds her back.” That is, one aspect of the doctor formation—time requirement for schooling—is a resource to make the career justification possible in the discourse. With a similar but slightly differing way of reasoning, the preparation before being a professional is also used as a resource to justify the choice of doctor.

Interviewer: which part situation you don:t like about it ((points to the “doctor” card))?
Claire: the schooling
Interviewer: oh:: i see (.) you have to take a lot of courses
Claire: a lot of courses (.) and i don:t know if i can handle that though (.) because my cousin tried taking

some of the course but he (.) it was too much for
 him (.) so::
 Interviewer: um:: so he give up?
 Claire: yeah he give up

Claire ranked “doctor” as her third preference. The discourse she draws on highlights the required “schooling” as a concern and describes the situation from a witness perspective—the cousin gave up being a doctor because of “too much” courses. Here, Claire draws on the formative repertoire to justify her position and further supported by a reliable voice—her own cousin who is a relative of Claire and would not likely lie to her. It is almost common sense that such *corroboration*—is there another witness to this event?—from a reliable witness has the tendency to make utterances stronger and more convincing.

In addition to the aspect about schooling of transformation to be a science-related agent, other aspects of career formations are also made salient in the formative repertoire. For instance, the following excerpt shows that the physical preparation required can be mobilized as a resource to justify and dis-identifying with the choice of “astronaut.”

Interviewer: you like the science subject but you don:t like
 astronomy?
 June: no
 Interviewer: why?
 June: well (.) i would love to go up into space, but it
 is so much preparation in order to do that, so if
 there is something in the future, someway to go up
 into space without all those ((waving hands))
 Interviewer: physical training?
 June: yeah, tasks, it is too much i think (.) but if you
 could just shoot up there, i would love to go
 Interviewer: then you would do that.
 Jun: yeah
 Interviewer: okay, so how about this one. ((points to another
 card))

The excerpt shows that the preparation before being an astronaut “so much preparation in order to do that” is a resource for justifying June’s choice in the conversation. The formative repertoire again helps June to convince her position to the other without being challenged. Besides the time or physical demands, the environments in the process of formation could also be dimensions for dis-identifying with a career. For instance, in the next excerpt, drawing on the formative repertoire Candy dis-identifies with being a “teacher.”

Interviewer: so a teacher?
 Candy: um:: so my philosophy on that is that, you go to
 school to get out of school, to go back to school,
 to go back to SCHOOL, again they need to be done,
 obviously teachers need to (.) because you know (.)
 yeah nobody, i can really respect someone who can
 go k to twelve, go to university and then come back

to maybe grade twelve or grade eleven, or, you know, that is not for me.

Interviewer: so how about the group named "inside"?

The discourse about getting oneself into and out of school ("go to school [K–12] to get out of school, to go back to school [university]" and "to go back school [K–12]") is described as a repetitive process to becoming a teacher. Here, we can see that situating something in similar environments in the process of becoming a teacher is a resource in the discourse to dis-identify with the career of "teacher."

As the six examples demonstrate, the formative repertoire, addressing special characteristics and requirements, legitimizes career choices without raising questions. We also find that when careers are commented upon as special and beneficial, a positive identification usually follows (see Table 3.1). That is, science-related identities of "specialist" and "beneficiaries" emerge with the formative repertoire in the discourse. This then illustrates the importance of discourse addressing special characteristics, benefits and advantages in the formation and transformation for becoming professionals, because they make the process of preparation meaningful and relevant.

Situating in Performance and Practice

The performative repertoire invokes discourse that highlights actions and performances practiced in particular occupations. When considering possible careers, relevant actions involved in these careers are often mobilized as resources to support career choices. For instance, in the discourse of choosing to be a scientist, the descriptions of experimental practice and hand-on activities in scientific projects are often utilized as resources to support such a choice. In this section, we illustrate how conversation participants draw on the resource of the performative repertoire to articulate career choices with three identifying and two dis-identifying cases.

The interview protocol was designed to understand ways of justifying the careers written on cards. After writing down "marine biologist" on a card as one of her preferred careers, Amy starts to articulate this card even before the interviewer has asked any question about it.

Amy: um:: marine biologist, i don't know, i have always, since i was little i just said i want to be a marine biologist
 Interviewer: OH REALLY? why?
 Amy: i don:t know WHY, i was just so drawn to it, like i LIKE animals (.) and the work experience that you get to do, it:s like going out on the site (.) and like seeing everything all the wild and how it naturally is like, i think it is just so amazing.
 Interviewer: you say all animals or marine animals?
 Amy: just marine animals
 Interviewer: okay

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The discourse drawn upon articulates the actions that a marine biologist would do in their work (i.e., “going out on the site” and “seeing everything all the wild”). Here, the excerpt shows that the actions performed by a marine biologist serve as a central resource to articulate the choice of becoming a marine biologist. In a similar way, the next excerpt shows how Kyla, for the benefit of the interviewer, mobilizes the performative repertoires as a resource to legitimize one of her preferred careers—immunologist.

Table 3.1. The interpretative repertoires and identification resources for talking about possible careers

Interpretative Repertoire	Identification Resource	Example
Formative	Formation or requirement of Actions	(Identify) Special and Beneficial Psychologist—“Psychologist, uhm I think psychology is so interesting... I love just learning about that”
		(Dis-identify) Too ordinary/ Astronaut — “well I would love to go up into space but it is so much preparation to do that”
		Too challenging (extreme cases) Immunologist —“I find it interesting like how you can work with, like viruses and find sort of ways to like slow them down and sort of test with that.”
Performative	Actions	(Identify) Practicable Dentist — “It’s just like drilling in your teeth, ah, I just oh, I cannot, like the noises, oh it just gets to my ears and it drives me crazy. I just can’t do it.”
		(Dis-identify) Impracticable Doctor—“After helping a patient, it would be pretty cool to see have them like smile you know”
Consequent	Effects of Actions	(Identify) Influential Chemistry/Math teacher — “There is no turnout, like sure you solve the equation but then what? what is the point?”
		(Dis-identify) Not influential/ Surgeon— “I would be like really paranoid that I would screw up or something and kill somebody.”
Potential	Action Potentialities	(Identify) Expanding Biotechnologist— “You can sort of branch out into different topic areas and a lot of it is sort of finding different ways to like make things better”
		(Dis-identify) Stationary Elementary teacher— “It usually kind of seems to stay the same, like the same curriculum. I think I would be more interested in being able to keep learning”

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Interviewer: okay how about this one? (points to the “immunologist” card)
Kyla: that one (.) i find it interesting like how you can work with, like viruses, bacteria, and find sort of ways to like slow them down and sort of test with that. (then continues to talk about being a teacher)
Interviewer: and which level you want to be a teacher?

In response to the interviewer’s question, Kyla draws on discourse that describes actions practiced in a working situation: an immunologist would have to “work with viruses,” “slow them down,” and “test them.” That is, the discourse in both Amy’s and Kyla’s cases depicts actions performed by the particular science-related agent to identify with a career.

In the following excerpt, Jennifer also draws on the performative repertoire for addressing many actions that occur at work to articulate her preferred career—being a marine biologist, but with an emphasis of her personal experience of working with them. After listening to Jennifer’s experience in a camp, the interviewer asks “which part” of the camp experience she liked most, thereby setting the student up to draw on this rather than other repertoires..

Interviewer: so which part you like (.) most?
Jennifer: um i liked the field experience, like going out, we went dredging and um which is where you pull a net behind a boat, and it drags along the bottom, and you pull it up and you bring it onto deck and you get to see what is on the bottom, all the sea life. so we have, like, at one point, we had an octopus actually, so it was this big and little and orange and swimming around in our hands, it was so cool, like sea cucumbers and um:: little decorative crabs and stuff, it was pretty fun.
Interviewer: wow::
Jennifer: yeah::

The discourse depicts many actions “went dredging,” “pull a net behind a boat,” “drags along the bottom.” Also, many plural pronouns are used in this discourse “we went,” “we had,” and “our hands” as if Jennifer had done the same as a biologist. The description of what Jennifer has done with the biologist illustrates her detailed observation of biologists’ work. These descriptions are vivid, and as vivid descriptions, they provide detail of incidents that can be used to create an impression that the speakers have made a skilled observation. In the excerpt, we see how the performative repertoire is mobilized for describing numerous actions to support the justification of being a marine biologist.

In addition to identifying with possible careers, the following excerpt shows that the performative repertoire could be mobilized to dis-identify with possible careers as well. After Elise wrote down one of her non-preferred careers on a card (“doctor [I can’t handle too much blood]”), the excerpt shows that the interviewer has noted the bracketed comment (“I can’t handle too much blood”) and asks Elise to

alk about her experience with blood. The discourse describes doctors' actions ("doctors are doing plastic surgery") and relevant associated phenomena ("blood") while acting as a doctor. In conclusion, Elise waves her hands and says "Oh my gosh, no" to express her comments on these actions.

Interviewer: do you have some experience with the blood?
 Elise: oh blood, no, i just get so nauseous. i don:t know, i just CAN:T handle it. like you know, people on the shows, on tv and when they are doing plastic surgery, and they:re like they show you that stuff on tv. now i am like, OH MY GOSH, no ((waves hands)).
 Interviewer: okay yeah, so now you:re going to category, so name (.) some way to group it

In this situation, the performative repertoire is mobilized in the discourse to justify a position of not choosing a doctor as a possible career. In the following statement, Alice also uses the resource of the performative repertoire to dis-identify with other careers (dentist or nurse).

Interviewer: why?
 Alice: well i don:t know. it:s just like the drilling in your teeth, AH:: i just UM:: i cannot ((waves hands)), like the noises, AH:: it just gets to my ears and it drives me crazy. i just can:t do it. and the nurse, i don:t know, i am taking chemistry right now and i don:t like chemistry (.hhh). and like my teacher is like, chemistry you have to know all this stuff. like AH:: it:s like, it is a lot of measurements and stuff.
 Interviewer: your dad would like you to do the nurse?

In a similar way, the discourse highlights the dentists' actions "drilling in your teeth" and Alice's unpleasant reactions "the noises ... it drives me crazy." Furthermore, dentist's actions are described as something impracticable ("I just can't do it"). As for being a nurse, Alice connects the occupation to chemistry, the subject that she does not like and the disliked actions "a lot of measurements" that her teacher has previously mentioned. Here, we can see that the performative repertoire is utilized for dis-identifying with being a dentist or nurse.

In mobilizing the performative repertoire as illustrated in the five examples, the discourse highlights occupational actions and performances and successfully justifies these career choices without being challenged by the interviewer in the subsequent turn. We also find that a positive identification often follows when a description has articulated actions as practicable. In other words, the discourse articulates these actions as practicable to identify with possible careers and impracticable to dis-identify with possible careers (see Table 3.1). The performative repertoire therefore exhibits science-related identities of "being successful practitioners." This then points out the importance of discourse that illustrates actions and their

practicability in careers, because they exhibit the nature of a vocation and what students can envision themselves doing them.

Consequence and Effect of Practice

The consequent repertoire invokes discourse about the effect, impact and influence of actions in occupations. In the discourse of justifying career choices, the consequence or influence of particular careers are often utilized as a resource to legitimize these options—e.g., helping people, improving the environment, having an impact on society. To exemplify the consequent repertoire, we demonstrate four identifying and two dis-identifying cases and one mixed case to show how the consequent repertoire is mobilized in and by the discourse.

“Psychologist” is one of June’s preferred careers. After June describes the work of being a psychologist, the interviewer asks, “Which part do you like most?” as a psychologist. The conversation then addresses the effects on other people then follows.

Interviewer: so which part do you like most? to be a psychologist.
June: um i like the helping part, helping people and making them better, yeah.
Interviewer: okay great, now you just write this one ((points to another card))

Here, the terms of “helping part,” “helping people,” and “making them better” derive from one form of discourse—the consequent repertoire, and are mobilized as a resource to justify a position (the choice of being a psychologist) without being questioned. In the following excerpt, the description of helping people is also used to justify the choice—being a pediatrician, but with a further description of the nature of the recipient.

Interviewer: why do you want to be a pediatrician?
Kelly: just because helping children and stuff like that (.) and it just i have always been fascinated with children and how, they are so innocent too and they can:t, and they are helpless as well.
Interviewer: okay

One particular kind of recipient (“children”) is made salient and further described as “innocent” and “helpless.” Here, the consequent repertoire is constituted not only by the effective acting (helping) but also the details about the recipient of the effect (innocent and helpless children). The resource of the consequent repertoire again makes possible the legitimization of the choice of being a pediatrician.

In addition to the description of the effective acting and recipients, the feedback from the recipient is also depicted in the consequent repertoire. In the next excerpt, Claire, who has noted “doctor” as a possible career choice, responds to the interviewer who is asking her about the aspect she likes most about being a doctor.

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Interviewer: and which part do you like most about being a doctor?
 Claire: after helping a patient, it would be pretty cool to see have them, like smile you know?
 Interviewer: and recover?
 Claire: yeah
 Interviewer: and which part do you like most about being a doctor?
 Claire: after helping a patient, it would be pretty cool to see have them, like smile you know?
 Interviewer: and recover?
 Claire: yeah

We can in this excerpt see that Claire draws on a form of discourse that not only describes a recipient's reaction ("smile") to the help, but also a doctor's reaction ("[feel] cool") in terms of the patients' feedbacks. These three examples above all illustrate how the resource of the effects of actions is mobilized to legitimize career choices.

The following example of the consequent repertoire also exhibits the effective act of "helping," but not with the exact term "help." It is concretely realized when Amy responds to the interviewer's question about Amy's choice of being a "sports therapist."

Interviewer: your first one would be sports therapist?
 Amy: therapist like working with people who have either injured themselves or (.) have problems that they don:t know how to solve. so just working with them to overcome THOSE kinds of:: things.
 Interviewer: mm:: what is the difference? ((points to other two cards))

Amy draws on a form of discourse that describes sports therapists' work with people who have injuries or problems and the help people receive for overcoming these issues. Here, the "help" is articulated in the expression "work with them to overcome (problems)," which posits the therapist as the helper of these injured people. These terms indicating the effective actions are all constituted the consequent repertoire that is available in the discourse for justifying career choices. In addition to identifying with possible careers, the consequent repertoire can be drawn upon to dis-identify with a career. The next excerpt shows how the consequent repertoire explains careers categorized as "disliked." Before the conversation, the student has put "pilot" and "surgeon" together and has named the group "precision/risk."

Joe: yeah and i wouldn:t want to be a pilot or a surgeon((points to the "pilot" and "surgeon" cards)) because (.) it seems too risky to me. like i:ll (.) if i was a surgeon, i would be like really paranoid that i would screw up or something and kill somebody. same with the pilot it is the same in a way, not for me.

Interviewer: okay great, so your number one is medical lab technician. could you talk about why you want to be a technician?

Here, we can see that the discourse that depicts the possible negative consequences (“screw up or something and kill somebody”) and an unpleasant reaction (“I would be like really paranoid”) to dis-identify with the careers of pilot and surgeon. It has been suggested that people frequently draw on what conversation analysts have come to call *extreme-case formulation* (Pomerantz, 1986) such as the extreme terms “never,” “completely,” and “every” to justify their arguments. Here, the mobilized discourse not only employs extreme terms (“too [risky]”) but also describes an extreme incident (“killing somebody”) to emphasize possible consequences. This extreme-negative consequence, a language resource accompanying the consequent repertoire, becomes an unchallengeable and convincing reason for dis-identifying with these careers.

To dis-identify with a career, the following excerpt shows that the consequent repertoire is used in a similar way with the previous case. “Teacher” is one of Amy’s preferred possible careers. In addition to the general question “how about teacher?,” the interviewer asks a more specific question about which academic subject she would like to teach.

Interviewer: okay great. how about teacher? Which subject do you want to teach?
 Amy: well i definitely wouldnt want to teach math, or chemistry, yeah no
 Interviewer: no math or chemistry?
 Amy: no math or chemistry.
 Interviewer: why? why not?
 Amy: i just don:t like i don:t like working with equations (.) it just bothers me. like there is no turnout, like sure you solve the equation but then what? what is the point?
 Interviewer: you mean:: you mean no meaning?
 Amy yeah sort of (.) there is no point

Amy does not answer this question directly, that is, she does not answer which subject she wants to teach but talks in an exclusive way, mentioning which subject she does *not* want to teach (neither math nor chemistry). Then the interviewer repeats what she heard by asking a question “No math or chemistry?.” Amy confirms the interviewer’s understanding by saying the same words but with an affirmative intonation “no math or chemistry.” The interviewer asks “why?” and “why not” to request further expansion. Amy first says that she does not “like working with equations” and describes an issue that bothers her—she does not see the point of doing an equation. Here, the discourse mobilizes one form of the extreme formulation “no turnout” and “no point” to emphasize the importance of knowing the point or the consequence of these actions for choosing a career. Here, we can see that the resource of the consequent repertoire with an extreme formulation is mobilized in and by discourse to strengthen particular justifications.

In addition to utilizing an extreme formulation in the consequent repertoire to (dis-) identify with possible careers, we notice in our database that another kind of rhetorical device—*contrast* (Heritage & Greatbatch, 1986) is mobilized to enhance justifications. For instance, in the following excerpt the contrast of different effects is articulated to justify a career option—becoming a marine biologist.

- Interviewer: so, why not? because you have a lot fun there, but you don:t want it ((points to the “marine biologist” card)) to be a career?
- Mandy: YEAH um:: (.) i guess i am more interested in things that affect humans, rather than kind of the marine animals. it:s (.) i kind of like the larger scale, like the actual visual impact rather than just (.) researching and knowing everything about crabs. but i guess to me it is more effective or (.) i:d feel like i was doing more if i was learning about diseases, so i could help people rather than just crabs.
- Interviewer: so you mean helping people is more?
- Mandy: yeah, helping people is more what i would like to do, having an impact and knowing that i am doing something.
- Interviewer: mm:: so how about this one? ((points to another card))

After mentioning a camp experience, Mandy comments that she had great fun at the camp but being a marine biologist is not her preferred career. The interviewer asks “why not?” and requests Mandy to elaborate on the phenomenon—she has fun working with marine biologists but does not consider it as a possible career. Mandy responds saying that what interests her more is “affecting humans *rather than* kind of the marine animals,” “the actual visual impact *rather than* just researching and knowing everything about crabs,” and “so I could help people *rather than* just crabs.” The terms “affect,” “help,” and “impact” indicate an emphasis on the effect and implication of a preferred career—the consequent repertoire. Here, the terms “rather than” appears three times in the excerpt thereby enhancing the contrast between helping people and helping animals. That is, the consequent repertoire together with the contrast makes Mandy’s statement more convincing and legitimate in the discourse.

As illustrated in these seven examples of the consequent repertoire, effects, influences, or consequences of actions are foregrounded as intelligible and unchallengeable resource for justifying career choices in the discourse without being questioned. We also find that the discourse about having influence on something is utilized as a resource for identifying with a possible career and having no or an extreme influence for dis-identifying with possible careers (see Table 3.1). That is, the articulation of having influence (except extreme ones) tends to be accompanied by a positive career identification in the discourse. The consequent repertoire thus co-articulates a science-related identity as a “contributor.” There are studies pointing out that girls, like most students in our study, choose science-related careers often based on being able to help people, animals, or environments. The conse-

quent repertoire is a useful component in discourse that addresses effects or consequences of professions, because it attributes feedback and meaning to practitioners' actions.

Potentiality and the Dynamics of Practice

The *potential* repertoire invokes discourse describing possibilities, potentialities or trends in one's career. For instance, being a scientist is often described as a preferred career in the discourse as someone who can learn something different everyday, obtain new information and even work on diverse projects. In the section, we list four identifying excerpts and two mixed excerpts to exemplify how the resource of the potential repertoire is mobilized in the discourse for justifying career choices.

After completing the mapping process, Wendy mentions that one group of her possible careers are all related to the subject of science. As illustrated in the following excerpt, a question appears in the discourse with regard to other subjects "why not History or English?" This then orients the interviewee to articulate particular form of discourse.

Interviewer: but why not history or english or
Wendy: i guess the sciences are more exciting, and there:s
endless possibilities to them.
Interviewer: hmm

Wendy responds to the question by drawing on discourse related to excitements "sciences are more exciting" and potentiality "there's endless possibilities." Here, we can see that an extreme formulation term "endless" is deployed to address the potential or the room in science. That is, the discourse allows potentiality to be utilized as a central resource for justifying a position to the other. In addition to the term of "possibilities," other terms could be constituted in the potential repertoire. For instance, in the following example Kyla draws on discourse that uses the term "different" twice, thereby reiterating the potential of being a biotechnologist.

Interviewer: how about number one? why do you want to be a bio-
technologist?
Kyla: um, because it really interests me and with some-
thing like that, from what i can understand, you
can sort of branch out into different topic
areas(.) and a lot of it is sort of finding differ-
ent ways to like make things better sort of and
find better ways to deal with things like oil
spills and stuff.
Interviewer: wow it sounds like you know this career very well

Sentences like "branch out into different topic areas" and "find different ways to make things better" show the diverse nature of work suggested in the discourse of being a biotechnologist. In the end, a description of one concrete example of these possibilities ("like oil spills") also supports the potential repertoire. The excerpt

here shows how the recourse of the potential repertoire can be utilized as an intelligible resource to legitimize a choice followed by a social appreciation of being convinced (“wow it sounds like you know this career very well”).

We also notice that the potential repertoire and extreme terms are often mobilized together to justify career choices. For instance, in the discourse of articulating the choice of being a surgeon as demonstrated in the following excerpt, the potential repertoire is embedded with many extreme terms. Before the conversation, having a goal is described as a consideration for choosing a career. With regard to the “surgeon” card, the interviewer asks goal related questions and therefore sets up a particular form of discourse to follow.

Interviewer: how about this one? ((points to the “surgeon” card)) you think they have high goals?
 Kelly: yeah you are always taking new courses, you are always having to update, you are always learning new things, it is never the same. all you (.) like you will probably never see the same injury ever. like maybe a broken bone, but it is never going to be broken in the exactly the same place. there are always going to be different situations like factors around and everything like that.
 Interviewer: ok so how about this one ((points to another card))

In response to the interviewer’s question about the surgeon card, discourse that describes the dynamic process of being a surgeon follows: “always taking new courses,” “always having to update,” “always learning something new,” and “always going to be different situation.” Here, we see the strong emphasis on the potential dimension of being a surgeon in terms of words like “learning,” “new,” “update,” “different.” Particularly, the extreme terms “always” and “never” occur four and three times, respectively, in the affirmation of a career. The excerpt shows how the potential repertoire can be mobilized repeatedly and integrates with extreme formulations to become an unchallengeable recourse for justifications in the discourse. In the next excerpt, the potential repertoire is also mobilized to buttress articulating a choice of being a family doctor but with a larger time scale description.

Interviewer: do you think this one ((points to the family card)) is a good career? the family doctor?
 Jack: yeah
 Interviewer: why?
 Jack: um:: well as a career, it is good because there is, well, a lot of room for advancement and learning all that, but, um mostly just it is something, i know i can enjoy it for a very long time. um something i can continue to be learning and using new information and all that for well, the rest of my life basically.
 Interviewer: do you mean you have to learn new information
 Jack: yeah, you would have to learn new information as the year passes

HSU AND ROTH

Interviewer: yeah, okay, so how about this one ((points to another card))

The excerpt shows discourse that articulates the continuous growth of being a family “a lot of room for advancement,” “continue to be learning,” and “learn new information.” This ongoing learning discourse is associated with a longer time scale “enjoy it for a very long time” or “the rest of my life.” Here, we can see that the discourse not only highlights the importance of these learning opportunities but also the progressive aspects of being a family doctor. That is, the resource of the potential repertoire is associated with a larger time scale and allows Jack to legitimize his career choice.

Similar to the formative, performative, and consequent repertoires, the potential repertoire can also be mobilized in the discourse to dis-identify with careers. In the following excerpt, Jennifer draws on the potential repertoire to describe nurse as a non-preferred career compared to people who take care of animals.

Interviewer: and how about being a nurse?

Jennifer: nursing, yeah yes and no. i have always thought about it but it doesn't, it isn't the same as marine biology (.) i think animals they can be very different, and human beings are like the same but with tiny bits of difference.

Interviewer: mm:: you said your grandparents live very near the ocean?

When Jennifer talks about being a nurse, she quickly compares it to her favorite career, marine biologist “it (nursing) isn't the same as marine biology.” Then she points out marine biologists' study targets vary (“animals can be very different”) and refers to the service target of nurses as similar (“human beings are like the same but with tiny bits of difference”). That is, the “difference” and “sameness” dimensions of the potential repertoire are mobilized to compare and justify these two options. In the next excerpt, Mandy also draws on the potential repertoire to produce a discourse that identifies and dis-identifies with careers (being a doctor and a teacher) but further connects to emotional descriptions.

Interviewer: so how about teacher?

Mandy: it is a lot of i don:t know, just preparation, and doing the same thing like. if i wanted to be a teacher, i would have to probably be more at middle school or something where you teach a range of subjects, rather than teaching the same thing year after year. i think i would get kind of bored of it when you are not learning. like with a doctor something you are always learning something new and kind of always having to update. where as with a teacher, it usually kind of seems to stay the same, like the same curriculum. so i think i would be more interested in being able to keep learning.

Interviewer: okay, so if you are a teacher which subject you teach?

The discourse articulates the non-changing aspect of being a teacher (i.e., they usually do the “same” thing) and associates emotional descriptions with the routine work (“I think I would get kind of bored of it”). Then another career (doctor) is contrasted with the first. The dynamic aspect of being a doctor is depicted (“always learning something new and update”) and the non-changing aspect of being a teacher is described (“stay the same”). Here, the discourse situates the student in the future and emphasizes that a career should be more dynamic and expanding rather than stationary. That is, the potential repertoire affords identifying and dis-identifying with careers in terms of these possibilities and potentialities for learning.

The potential repertoire, as demonstrated in the six examples, allows making explicit potentialities and possibilities of actions to support the justifications of career choices without being challenged in the discourse. The discourse tends to identify with science-related careers when these are associated with possibilities of personal growth, variety, potential, and diversity. That is, the discourse makes salient the expanding action possibilities as important resources in identifying with possible careers, and a stationary state as a resource for dis-identifying with possible careers (see Table 3.1). That is, this potential repertoire co-articulates a science-related identity as a “lifelong learner.” This then shows us the importance of discourse addressing possibilities that careers offer, because they not only serve as goals for learning practices but also as goals of transcending present-day achievements.

In summary, the formative, performative, consequent, and potential repertoire not only allow students to justify the preferences they have among different possible careers, but also co-articulate particular forms of identities as specialist, beneficiaries, practitioners, contributors, and life-long learners, respectively.

SCIENCE AND NON-SCIENCE RELATED CAREERS

In the previous section, we introduce and demonstrate concrete examples of four salient interpretative repertoires mobilized in the science-related careers discourse. Our focus is to identify the repertoires that make career choice justifications possible. That is, the previous section articulated the possibilities of constituting and supporting career options. This, however, does not tell us much about how substantive these resources are to help a particular group of students, here eleventh-grade high school biology students participating in career-related interviews, to justify their choices. To get a better picture of how students use these repertoires, we show in this section how frequently interpretative repertoires are employed and whether interpretative repertoires are used differently for articulating science and non-science related careers.

In the interviews, students were asked to name careers they would like and would not like to pursue and further ranked their choices in terms of the degree of their preference and dis-preference. Students noted between two and 20 different careers. For the purpose of representing the data, we selected the first three ranked

Table 3.2. Frequencies of interpretative repertoires when articulating the first three preferred and dispreferred careers in 13 students' interviews.

Interpretative Repertoire	Identification		32 preferred careers and 27 dispreferred careers			
			Science (28 careers) 65 times		Non-Science (31 careers) 34 times	
Formative	Identify	Special and beneficial	13 times (20%)	10 (15%)	2 times (6%)	0 (0%)
	Dis-identify	Ordinary/ Too challenging	0 (0%)	3 (5%)	2 (6%)	0 (0%)
Performative	Identify	Practicable	21 times (32%)	18 (27%)	17 times (50%)	2 (6%)
	Dis-identify	Impracticable	3 (5%)	3 (5%)	15 (44%)	15 (44%)
Consequent	Identify	Influential	19 times (29%)	17 (26%)	9 times (26%)	1 (2%)
	Dis-identify	Not influential/ Too influential	0 (0%)	2 (3%)	6 (18%)	2 (6%)
Potential	Identify	Expanding	12 times (19%)	11 (17%)	6 times (18%)	0 (0%)
	Dis-identify	Stationary	1 (2%)	1 (2%)	6 (18%)	6 (18%)

careers in each list (likes and dislikes) and counted interpretative repertoires used in articulating their reasons for choosing these careers. From these 13 students, we collected 37 preferred and 37 dis-preferred careers. We find that students use these interpretative repertoires to articulate 32 preferred and 27 dis-preferred careers (see Table 3.2). That is, 86% of the preferred careers and 73% of dis-preferred careers were buttressed by these interpretative repertoires. On the average, 80% of careers were articulated and supported by these four interpretative repertoires that serve a high degree of representative quality.

In the interview discourse, students also informed us whether their careers choices are science-related or not. Most students' preferred careers are science-related and some students' preferred careers are non-science-related careers (e.g., lawyers, singers). To count the frequency of using repertoires to articulate these 59 careers (28 science-related, 31 non-science-related), we use turn-taking as a unit. That is, we consider the communicative act as a unit—interviewer's question, student' answer, and interviewer's response—as illustrated in the previous excerpts. Sometimes, students drew on several interpretative repertoires to articulate a single career, whereas sometimes only one interpretative repertoire was employed. Also, these interpretative repertoires may be embedded together for articulating these career choices. To support their choices of the 28 science-related careers, students used the four interpretative repertoires a total of 65 times and 31 non-science-

related careers for a total 34 times. Because students spent more time talking about their science-related careers (probably relating to the fact that they were situated in a science class and the researcher is associated with a science-project), we interpret the data in terms of percentage information that allows us to have a better baseline for comparison. The results are summarized in Table 3.2 in terms of different interpretative repertoires, identification, and (non-)science related careers.

From the frequency of the formative repertoire, we can see that the formative repertoire for articulating science- (20%) was mobilized more than non-science-related careers (6%). Also, these science-related careers were described as something special and beneficial in the transformation of being a science agent and justified as possible careers (15%). However, some science-related careers were articulated as something too challenging to achieve (e.g., doctor, astronaut). As for non-science-related careers, being a non-science agent was not described as special and beneficial but as something too ordinary and not requiring schooling or preparation (6%). From the frequency of the performative repertoire, it is noted that the performative repertoire was mobilized most to reason both their choices for science- (32%) and non-science-related careers (50%). The actions in science-related careers were described as practicable actions (27%) to identify with a career, whereas the actions in non-science related careers were depicted as something impracticable (44%). With respect to the consequent repertoire, we find that it was mobilized to support science-related careers (29%) and non-science-related careers (26%). However, science-related careers were portrayed as influential practice and as making important contributions to society (26%), whereas non-science-related careers as not influential practice (18%). As for the potential repertoire, it was used equally to legitimize science- (19%) and non-science-related (18%) career choices. Nevertheless, most science-related careers were described as having many action potential and possibilities (17%) and non-science-related careers as having repetitive practice and without potential for learning (18%). In summary, the discourse sample produced during the interviews suggest that among the four repertoires the performative repertoire was articulated more predominantly for both science and non-science careers, and the formative, consequent and potential repertoire were used less frequently. In particular, the formative repertoire is utilized more frequently to articulate science-related than non-science-related careers.

UNDERSTANDING SCIENCE-RELATED CAREER DISCOURSE FROM A DISCURSIVE PSYCHOLOGICAL PERSPECTIVE

In this chapter, we investigate the forms of discourse that is and can be employed in (interview) conversations about possible futures generally and possible science careers in particular. The topic is salient because one of the aims of science educators is to recruit students into science and science-related careers. However, lack of student enrolment and interest has become an issue in science education. A related issue is that of science-related identity. Understanding science-related identities in discourse is useful because it accounts for the importance of both individual agency as well as societal structures that constrain individual possibilities. To un-

derstand career-related aspects of possible science identities, we invited high school students who were enrolled in a science honors class to talk about their possible careers. The rich science-related discourse in our recordings provides a great opportunity for understanding descriptive connections to science.

We identify four interpretative repertoires that function like tool kits in talking about preferred and dis-preferred careers: the (a) formative, (b) performative, (c) consequent, and (d) potential repertoires. Our research shows how this discourse describes science professionals in terms of “what is required for them to become a science agent (formative repertoire),” “what they do (performative repertoire),” “what they do in relation to others (consequent repertoire),” and “what they can do differently as a science agent (potential repertoire).” As illustrated in this chapter, these interpretative repertoires are mobilized as discursive resources to identify and dis-identify with career choices. In particular, science-related identities emerge in such students’ careers identification discourse include (a) beneficiary in the process of becoming, (b) competent practitioner, (c) contributor in and to the world, and (d) lifelong learner. That is, the study not only identifies interpretative repertoires that serve as cultural resources for helping students to articulate their career choices, but also illustrates science-related identities that are co-articulated in such discourse.

We draw on discursive psychology, which is less concerned with *these* students and more with the possibilities of the English language and current Anglo-Saxon culture for talking about and defending (dis-) preferred careers. Our study therefore provides us with insights not merely about *these* students but into the culture that they represent and where their ways of talking makes sense. That is, these interpretative repertoires illustrate a culture that allows us to understand how these high school students who have had rich science experiences relate to science in general and how they identify with science-related careers in particular. In fact, “the immediate social situation and the broader social milieu *wholly determine—and determine from with*, so to speak—the structure of an utterance” (Vološinov, 1973, p. 86, our emphasis). For our case, these forms of language use—interpretative repertoires—not only allow us to illustrate the discursive resources *during the interview* (the immediate social situation) but also the relevant ideology *shared in the culture such as the high school or society discourse* (the broader social milieu) concerning science-related careers. For instance, we find that the interviews tend to articulate science-related careers as something that requires more special and specialized characters or requirements than non-science-related careers. This then provides us with a site for discussing why such a difference exists in career discourse. Do people always articulate the special and specialized characteristics for becoming a science agent in the society? Is the image or ideology of science-related careers distant from other careers? Do they interfere with students’ decision-making at the time they choose their careers? These are important issues to facilitate our deeper understanding about the process of considering career choices and can serve as research questions for further investigations.

The purpose of a democratic science education cannot be to manipulate students into choosing this over that career. The way in which our study can help science

educators and teachers is in providing students with the possibilities of extending their repertoires in depth and in breadth. Therefore individual students may learn to participate in mobilizing these interpretative repertoires, which are usually invisible and used implicitly, to articulate some positions over others both for themselves and relevant people around them. That is, those students who have less experience in articulating science careers may learn from these interpretative repertoires to help them justify their positions concerning future careers.

Our research has practical implications. Thus, individuals interested in recruiting students into science could practically use our findings by addressing students in terms of these repertoires. For example, career counselors can draw on discourse that integrates these repertoires in career workshops or seminars for the purpose of recruiting students into science; teachers can employ these repertoires to encourage students participating science-related science activities; educators or researchers can integrate these repertoires for writing about the life world of scientists in textbooks; and scientists can draw on these repertoires guiding students to appreciate their work and relate to themselves in outreach activities or internship especially. It is especially useful when educators, researchers or scientists can only convey certain aspects of science work in a short time to students. With these repertoires in mind, they thereby ascertain not only that students find such talk intelligible but also that they find it convincing, increasing the probability that students are drawn into science-related fields. Importantly, students can develop a sustained interest in science especially when their science experience connect with their envision of futures. The interpretative repertoires identified in our study may serve as discursive resources for bridging such connections for students.

Our study also has relevance to the expansion of the theoretical frameworks science educators may use for framing and doing research. In most experimental studies, researchers presuppose language as a neutral window used to detect what individual has in mind. However, because “language is for the other, coming from the other, the coming of the other” (Derrida, 1998, p. 68), what students say is inherently possible to be said within their culture and therefore not so singular at all. That is, language is never neutral or owned by individuals but shared and mobilized in the culture. It is therefore important to have a theoretical framework that allows researchers to confront the nature of language—the foundation for almost every kind of social science research. Discursive psychology is a theory and method for studying discourse without attributing characteristics or psychological features into individuals’ minds (which are forever inaccessible in any case). The discourse we analyze is used by interview participants (students, researcher) who talk about a new topic; they do so by drawing on discourse and repertoires that they, by the very fact of using it, assume to be intelligible, available, and unchallengeable. That is, rather than taking individuals as the units of analysis, which is the characteristic of most of previous studies, we analyze and theorize *discourse*, which never belongs to the research participants alone or even to the research situation (including the interviewer, interviews, and available tools) but to the culture as a whole.

Our study also engenders possibilities for future research. Research may aim at identifying forms of discourse and the discursive repertoires drawn upon prior to and following special programs in which students engage for the purpose of increasing their interests (e.g., participation in summer workshops, laboratory internships, or participating in environmentalist activities). Further research might be conducted with different participants who are situated in different cultures such as with non-science major students, pre-service teachers, service teachers, principles, and scientists about their science discourse. Finally, research might be conducted to find whether the forms of discourse and the discursive repertoires can be found in other regions of the world and across languages. If there were additional discursive features and repertoires, of interest would then be to identify the additional forms of identity that are co-articulated in the discourse.