

The Optimal Reference Guide:
Articulating the Case for Course Numbers

Extraordinary insight into today's education topics

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Course Numbers

Is English 1 in Jasper, Missouri, equivalent to English 1 in Casper, Wyoming? Each year, over \$70 million is expended to interpret the courses on school records sent from one education agency to another. That's equivalent to having over 2,000 full-time registrars doing nothing other than interpreting the course information on transcripts and making a judgment of how to credit those courses in local systems. More significantly, how well do those human judgments serve the students?

There is a compelling need for upgrading the course classification systems and the course numbers used by our schools. In our mobile society, the interpretation of education records by a receiving school determines whether or not students repeat courses or move on to higher level ones. Interpretations of courses and credits determine scholarships, NCAA eligibility, admissions to postsecondary institutions, and even job qualifications. The interpretation process today is mainly a manual, human effort relying upon cryptic course titles, general course descriptions, and thousands of ever-changing course catalogues.

There is a solution. Many individual education agencies, especially postsecondary institutions, have negotiated articulation agreements with each other. A few states have statewide postsecondary articulation agreements, and a few more have PK-12 statewide course classification systems. What is needed is a virtual national course articulation, or crosswalk, process. One high school classification system to consider as the canonical catalogue to which all others could be crosswalked is the National Center for Education Statistics' newly minted SCED, School Codes for the Exchange of Data.

This Optimal Reference Guide explores how course numbers might be created and used to address these issues.

The Surprising Range of Uses for Course Numbers

Course numbers are everywhere now. They are just not very well organized across agencies, and they are, by self-report, not very well implemented. From a high-level perspective, here is a listing of uses that a well-conceived and implemented course classification system can serve.

For the Local Education Agency

1. Scheduling of classes within a student information system software application
2. Ensuring course sequence requirements are met by enabling automated analysis processes to supplement human inspection
3. Grade reporting using course numbers to match grades entered by the teacher within report card production processes
4. Promotion decisions based upon course completion, grades, credits, or assessment proficiency level
5. Graduation decisions based upon course requirements and grades aligned with catalog/requirements for a specific graduating year



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The benefits from a course classification system are illustrated in an Iowa Case Study, see page 11.



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6. Grade point average derivations using weighted values for advanced courses
7. Course credit accounting using an electronic catalog aligned with an academic record
8. Reports to the state education agency documenting course enrollments and completions
9. Reports to the Office for Civil Rights documenting course enrollments by gender and race/ethnicity for students and teachers
10. Employment follow-up tracking former students and evaluating the benefits of individual courses
11. Postsecondary follow-up for career education evaluation based upon course completions
12. Transcripts, especially electronic records, in and out for mobile students documenting course history
13. Dual credit with postsecondary using electronic or paper verification exchanges

For the State Education Agency

1. Highly qualified teacher determinations where credentials must be matched with course taught
2. Graduation requirements using courses reported to the SEA to track enrollments for accountability, accreditation, or state funding
3. Scholarship decisions based upon courses and credits
4. PK-12 with postsecondary data exchanges for evaluating benefits of course completions on postsecondary success

For the U.S. Department of Education/National Center for Education Statistics

1. Course enrollment reports
2. Office for Civil Rights Reports
3. National transcript studies

For Postsecondary and Co-Academic Institutions

1. Transcript evaluations for admission decisions
2. Scholarship eligibility
3. NCAA determination of eligibility for participation in athletics
4. Continuing education credits reported back to LEAs
5. Prerequisite confirmation for employment
6. On-going training and development for promotion decisions

What is Changing?

Electronic exchanges of data between institutions have created the expectation that a human should not be required to intervene more than minimally. Humans' judgments are inconsistent with each others'. Humans key data incorrectly. This creates a reliability problem. For example, in states where there is a writing assessment, the readers who score them are highly trained and supervised. In fact, the writing samples are graded by more than one reader, and when the original ratings vary by too much, a super rater is used. In the world of student record exchanges, typically only one human on the receiving end makes the determination of how to interpret another school's course and how to match it to a local course.

Veteran registrars have developed considerable expertise in interpreting course records. However, registrars come and go, and are frequently presented with transcripts from new schools. A major challenge for them is the changing course catalogues that present a moving target even for registrars who have already established a crosswalking system from another school's course records.

One of the few remaining major challenges to the conversion by all schools to electronic exchanges for student records is that the receiving school still has to manually inspect and interpret the courses. We need to create those articulations that allow an electronic transcript to be received and the course numbers be automatically crosswalked into the recipient's local course classification system.

Currently the onus is mostly on the recipient to make these crosswalks. Logically, the sender should be much more than an inactive partner in this translation. After all, the sender knows much more about the nature of the courses than does the recipient. If the two can agree upon an articulation, and keep it current, then all will be well served—especially the student.

The Improving America's Schools Act and the No Child Left Behind Act demanded that states establish academic standards. States have been deliberate in their pace to align those standards with individual courses. However, a fully functional course classification system requires that the individual course be defined by the standards they teach to ensure each student has an opportunity to learn before taking the corresponding assessment.

The bottom line is that an official alignment of standards, courses, and credits is far superior to having individuals make personal interpretations of other schools' courses--over and over.



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Interpreted: the process of determining the content, academic standards, and credit associated with a course

Matched: the process of finding the local course that matches the one taken by the student

Comparison to Student Identifiers

ESP has written multiple papers about the characteristics of statewide student identifier systems and how the student numbers should be assigned and managed.

Statewide Student Identifier Systems, Requirements for a Request for Proposals for Statewide Identifiers, both ESP Optimal Reference Guides, are available when you sign up for a free My ESP page on our website, www.espsolutionsgroup.com.

Contrasting student and course identifier systems highlights some interesting differences between the two.

Issue	Student Identifiers	Course Numbers
1. Use of letters in the identifier	Universally, numeric-only systems are more trouble-free.	Alpha-numeric course identifiers are common, but numeric-only systems are adequate.
2. Length of the identifier	9-10 digits are common. Longer identifiers present a data quality challenge.	Longer identifiers are used by some agencies. NCES's older course classification system can use 13. SCED uses 12
3. Leading Zeroes	Most systems do not allow leading zeroes, which are a major source of error.	They should be avoided for course numbers for the same reason.
4. Trailing Zeroes	Less of a problem, but still very undesirable for data quality.	Just avoid them.
5. Repeating Characters (e.g., 123334567)	Fewer than 3 has become a standard to avoid manual errors.	Fewer than 3 should be the standard.
6. Randomness	The best systems have no embedded meaning in the student identifier.	Course numbers typically have embedded meaning that indicates content area, level, or term.
7. Check Sum Digit (a final number that is mathematically derived from the other numbers; used to verify that a number is valid)	These have become popular, but are not necessary.	These are unknown in this arena. They shouldn't be needed because there are so many fewer numbers in the entire course classification system than in a student system. Checks can be made against the whole catalogue in about the time a check sum digit can be calculated.
8. Cross-State Articulation	States maintain their own state-specific identifiers.	Articulation agreements exist between individual trading partners rather than whole states.
9. Uniqueness	The student identifier must be unique across all students in a state and across as many years as possible.	Course numbers are intended to be redundant to indicate alignment of courses across entities and time periods.

History of NCES and Other Course Numbers


In the early 1990's, discussions around the development of the electronic format for an electronic student record, called SPEEDE/ExPRESS, raised the need for a course numbering system that could be used by schools and postsecondary institutions to evaluate the courses taken by students for credit, transfer, or acceptance. Some states had developed course codes for required state courses. The National Center for Education Statistics (NCES) had a course coding system in place for many years for their high school transcript studies called the Classification of Secondary School Courses (CSSC). But a consensus-developed national elementary and secondary school course coding system did not exist.

With the assistance of state and local representatives and existing state and local coding systems, NCES sponsored the development of a new system of standard national course codes called the Pilot Standard National Course Classification System for Secondary Education (SNCC). This system unfortunately did not provide codes for elementary and middle schools. It did, however, include most subject areas for which courses are offered in comprehensive high schools in the U.S. To date, only a few states (e.g., Iowa, Nebraska, and Nevada) have used SNCC for state course codes. *Iowa's case study on page 11 describes how one state has implemented course numbers and the benefits they see.*

Since NCES was the originator of both of these course coding systems, it was assumed that they would adopt only one for use across the statistical agency. To inform this decision, Barbara Clements of ESP Solutions Group was contracted with to do a crosswalk of the two coding systems. The crosswalk identified many areas of agreement. But there were also codes in CSSC that were not allowed for in SNCC and vice versa. Because CSSC is simply added to as new courses are encountered in high school transcripts they evaluate, they elected to stay with the CSSC for continuity purposes.

The movement by state education agencies to electronic data exchanges and longitudinal databases led to a new consideration of the need for standard course codes for elementary and secondary schools. NCES worked with state and local education agencies to develop a new course code system. Building on the two other NCES systems, the School Codes for Exchanging Data (SCED) provides the needed set of course codes for secondary courses, and the potential for elementary/middle school courses. At present, the only available elementary/middle course codes are contained in a data element in the NCES Handbook Online – Elementary Subject/Course.

For many years, postsecondary institutions have had a coding system called the Classification of Instructional Programs to help in coding courses. According to the National Center for Education Statistics, which originally published the CIP codes in 1980, the "CIP is a taxonomic coding scheme that contains titles and descriptions of primarily postsecondary instructional programs. It was developed to facilitate NCES's collection and reporting of postsecondary degree completions by major field of study using standard classifications that capture the majority of reportable program activity." But this was not really sufficient to help postsecondary institutions

 **ESP Insight**
NCES has been the one national entity that has tackled creating a universal course classification system.

evaluate courses that students took in other institutions. As a result, many universities have developed articulation agreements. To help with automating the establishment of these agreements, an EDI format was developed called the Educational Course Inventory (X12 Transaction Set 188). This automated process actually requires manual compilation of descriptive data that can be put into a standard format for sending to another postsecondary institution. Once the articulation is agreed upon, it need not be done again. Still this was not very useful for most postsecondary institutions. As a result, the Postsecondary Electronic Standards Council (PESC) embarked upon a project to identify postsecondary course codes beginning in Fall 2006.

Challenges for Every LEA and SEA to Adopt Common Course Numbers

Some general issues related to course numbers provide an interesting perspective on some of the challenges states face.

- Elementary/middle schools are not sufficiently covered in most existing course classification systems.
- State codes are rarely matched to national codes.
- State codes are not sufficient for local use (local schools want many more course codes than an SEA is typically interested in managing).
- If course information is sent up to an SEA then received back, detail is lost because there are so many more local courses than most state systems include.
- Cross-state comparisons are not possible if national codes are not used, so the benefits for mobile and migrant students are limited.
- Required courses for attending postsecondary institutions are not indicated.

The Bottom Line

We believe that the implementation of common course classification systems across the country and the crosswalking of them together is an essential next step for education agencies. Many years of discussion and planning went into moving the country to almost universal assignment of statewide student identifiers. Now, SEA staff understand how virtually impossible it would be to manage their assessment and accountability systems without those identifiers. The electronic exchange of student records as provided by the National Transcript Center, utilizes interpretable course identifiers to maximize the benefits and efficiencies. Every national standard for electronic student records, e.g., SPEEDE/ExPRESS, PESC, and SIF, includes course numbers (local, state, and others) in its format.



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ESP's Optimal Reference Guide, *Electronic Student Records and Transcripts: The SEA Imperative* is available when you sign up for a free My ESP page on our website, www.espsolutionsgroup.com.

We have published predictions of where we believe education information systems are heading in the future. All of those include the expectation that states will embrace the benefits of common course numbers or at least crosswalks that allow efficient and error-reduced interpretations of academic records when they are exchanged between agencies. Our recommendation is that every SEA seriously evaluate the benefits of adopting or cross walking their extant system to the new SCED standard.

Iowa Case Study: Course Classification Proves Beneficial

Leland Tack and Coleen McClanahan, Iowa Department of Education

In 1995-96 the Iowa Department of Education initiated a project to facilitate the use of school districts' administrative student record systems for the electronic transfer of student records. The project was named EASIER (Electronic Access System for Iowa Education Records) and was initiated as a voluntary program to leverage local school district student information systems to meet state reporting requirements, reduce data burden, improve data quality, and improve the timeliness of reporting. Started in 1996-97 with six school districts agreeing to pilot the sending of individual student records to the Department, the initiative grew quickly into a voluntary statewide initiative culminating with 100 percent participation with the implementation of the No Child Left Behind legislation.

Two of the goals of the initiative were:

1. Sending individual records to the Department for the completion of required state and federal reports and
2. Facilitating the electronic exchange of student transcript data between public school districts and postsecondary institutions.

Prior to the initiation of EASIER, districts were required to submit summary data to the Department regarding students and courses. Typical summary reports on students included enrollment by grade by gender, race/ethnicity, and English language learner status. Reports on courses that students were taking included total enrollment by gender, Carnegie unit value, local/state course name, and a six-digit state course code. Project EASIER was designed to use course information directly from each student's electronic record that was used by the district for administrative purposes such as class scheduling. This meant that districts would not need to complete and send a separate curriculum report to the Department each year. Instead the individual student records would be summarized at the state level to determine what was being offered and taught in each high school.

School districts in Iowa are required to offer and teach a minimum number of units in science, mathematics, English, social studies, foreign languages, physical education, vocational education, fine arts, and health to remain accredited. Department staff through either desk audits or on-site visits annually review the courses offered and taught in each district. Also for accreditation purposes, courses taught by a teacher are matched against the areas in which a teacher is licensed (endorsed).

To achieve the reporting expectations and potential of a new student-level reporting system, it was clear to the Project EASIER Advisory Committee and to Department staff that reporting and coding standards were needed at the local and state level. One primary area needing standardization was course content and course codes. A cursory review of local course titles made it very clear that many were selected to entice students to take a course and not to reflect content.



The need for standard, well-defined, uniform course codes and course descriptors at the secondary level was expressed by the university personnel as well as by district and Department staff.

The Iowa Department of Education worked very closely with registrars and admissions officers from Iowa's three public universities from the very beginning of Project EASIER, and staff representing the universities were actively involved in the development and implementation of the SPEEDE/ExPRESS transcripts standards. The need for standard, well-defined, uniform course codes and course descriptors at the secondary level was expressed by the university personnel as well as by district and Department staff.

At the same time that the Iowa Department of Education was in the process of designing Project EASIER to leverage local student information system for reporting to the state and for the purpose of sending transcripts electronically to postsecondary institutions, the National Center of Education Statistics (NCES) released its Pilot Standard National Course Classification System (SNCC). The Department selected the SNCC as a means to have a standardized course coding structure and with the expectation that it may be eventually used as a national standard. Further support for the adoption of SNCC was its inclusion in the SPEEDE/ExPRESS transcript standards, which were maintained by the Data Interchange Standards Association and accepted by the American National Standards Institute.

Staff in school districts, however, were far more interested in what the 13-digit SNCC code meant for them compared to the local name and six-digit code they historically had been providing to the Department. They wanted to know what they had to code in each of the required fields, how to match content and codes, how to construct an appropriate course code, and what the consequences would be if the new code, which would better reflect the actual local course content, didn't match the content area for which a teacher was licensed to teach. They understood that the Department wanted to change from using local course titles to using the content descriptor for determining the course code but they also wanted to know the future usage of the new system and how they would convert the coding in their student information systems.

To accomplish the conversion to the new coding system, the Department undertook a series of regional workshops across the state to help districts crosswalk from their local course codes to the 13-digit SNCC code. Many districts used a team of individuals including curriculum coordinators, subject area specialist, counselors, and principals. The mix of individuals varied typically by the size of the district. Larger districts tended to have subject matter specialist or Department heads in a subject area. Each team was given what the district had most recently reported to the state and a copy of the SNCC handbook. General training was provided on the handbooks content, and what each field in the new code meant. Illustrative examples were used to demonstrate what was to be coded. Each school district was then asked to begin work on matching all existing courses to the new SNCC code. Department staff spent the remainder of the day working individually with the district staff present at the workshop.

In addition to the 13-digit PSNCCS code, a code for Department use was added to the reporting requirement. This code would enable districts to report the area where the course should be considered for accreditation. Districts were told that

they would not be penalized when they converted to this new code and that the Department would continue to consider the course for teacher licensure (accreditation purposes) as it had been most recently used. For example, if a teacher licensed as an English teacher was teaching a Business English course (which may require a license endorsement in the business education area) but the course was historically considered an English course, the Department would continue to approve the teacher-course combination as an English course for teacher licensure/accreditation purposes.

With course content described through the PCNCCS coding structure, the Department was now able to determine by the course code that different districts were actually teaching the same course, even though the local course titles were different. For example, if districts titled courses such as Introduction to Algebra, Algebra I, Algebra, or Beginning Algebra, the PCNCCS course code would enable Department staff to determine if these were or were not the same course. This was of interest not only to the Department, but also to registrars and admissions officers at the state's three public universities. The PCNCCS coding structure provides postsecondary institutions well-defined information on the curricular preparation of students applying for admission. The importance of and interest in having standardized course information has expanded to the state's 15 community colleges as well.

Although only one Iowa school district, the Des Moines Independent Community School District, has been sending transcript data electronically to Iowa State University and the University of Northern Iowa, all districts are using the coding structure of PSNCCS. This common coding structure has readied all districts to have quality information on their transcripts whether paper or electronic and has prepared districts to move to the newly released version of the course code classification system. Although it may be two or more years away, it is the Department's intent to convert course code reporting to the 2006, NCES Secondary School Course Classification System: School Codes for the Exchange of Data (SCED).

As with the initial pilot system, this new, improved, and easier to understand classification system, will provide information to parents, schools, districts, departments of education, postsecondary institutions, and policymakers in a meaningful way. Converting from a non-standardized coding/naming convention to a system that provides for "Codes for the Exchange of Data" has already been beneficial and is only expected to increase in importance in years to come. The Iowa Department of Education has received support from both the secondary and postsecondary community for a course classification that is universally used. Both the short and long-term benefits have made the effort worthwhile.



About ESP Solutions Group

ESP Solutions Group provides its clients with *Extraordinary Insight™* into K-12 education data systems and psychometrics. Our team is comprised of industry experts who pioneered the concept of “data driven decision making” and now help optimize the management of our clients’ state and local education agencies.

ESP personnel have advised school districts, all 52 state education agencies, and the U.S. Department of Education on the practice of K-12 school data management. We are regarded as leading experts in understanding the data and technology implications of the **No Child Left Behind Act (NCLB)**, **Education Data Exchange Network (EDEN)**, and the Schools **Interoperability Framework (SIF)**.

Dozens of education agencies have hired ESP to design and build their student record collection systems, federal reporting systems, student identifier systems, data dictionaries, evaluation/assessment programs and data management/analysis systems.

To learn how ESP can give your agency *Extraordinary Insight™* into your K-12 education data, contact Greg Nadeau at (781) 370-1017 or gnadeau@espsg.com.

This document is part of *The Optimal Reference Guide Series*, designed to help education data decision makers analyze, manage, and share data in the 21st Century.

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