Teacher-Student Data Link in Data Models From Transactional Systems to the Data Warehouse

Presented at:

NCES (National Center for Education Statistics) Winter Forum and 24th Annual MIS (Management Information Systems) Conference, Austin,TX

Presented by:

Jim Goodell, jgoodell@celtcorp.com

Cody Decker (ADE), cody.decker@arkansas.gov

Laura Sonn, lsoon@dataqualitycampaign.org

Presentation Date: February 24, 2011

Teacher-Student Data Link Models

- What it looks like:
  - 3 types of data structures
  - Essential elements for most likely uses
- Quality of the TSDL:
  - Key Components (success factors)
  - Accurate and Trusted TSDL
  - Roster Verification/ Certification

Three Types of Data Models

1. Transactional/Operational Reference Model
2. "Interoperability" Model
3. Dimensional Model

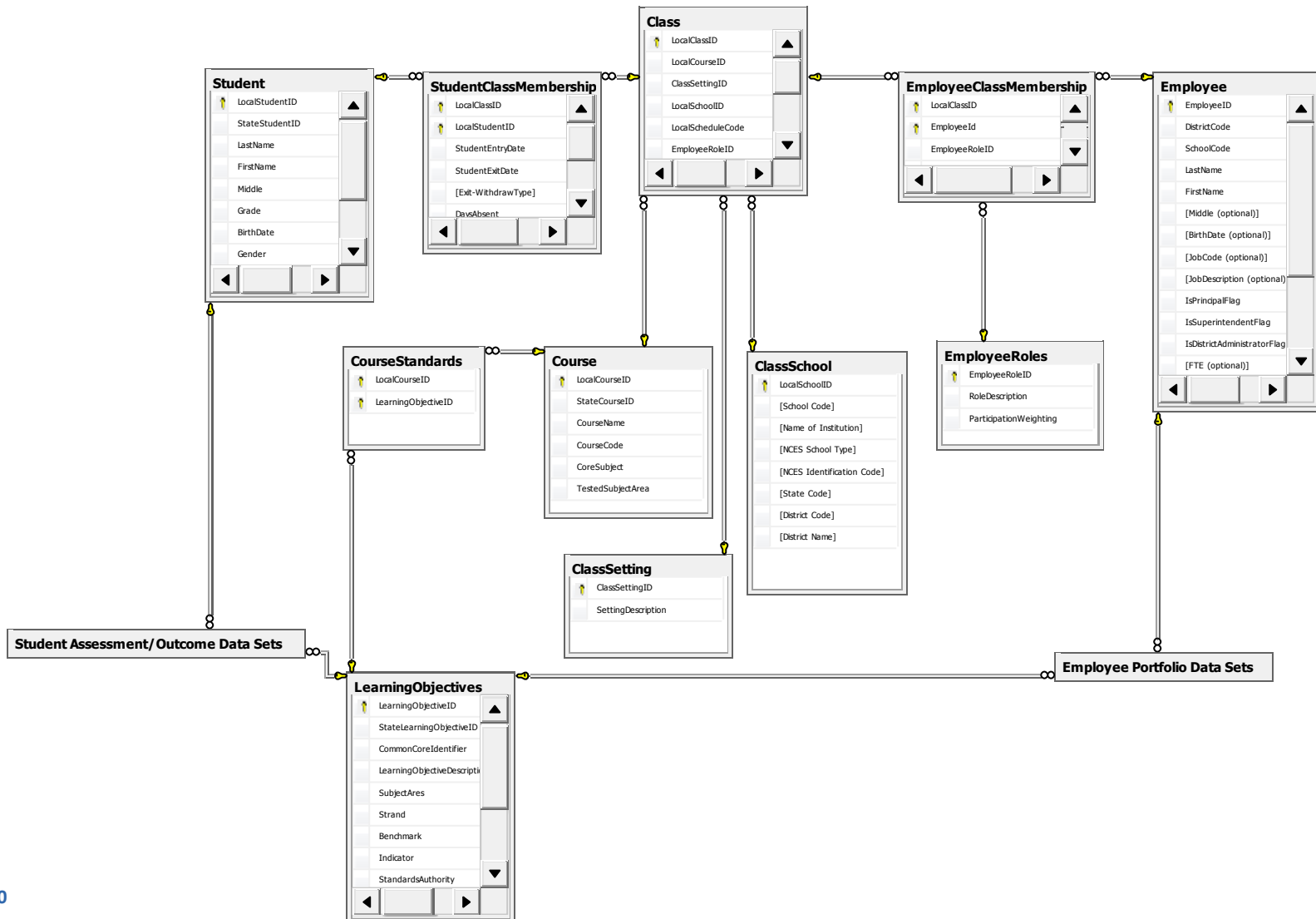# Warning!!! Please read and acknowledge the following terms and conditions:

There is no technology-only solution to the Teacher-Student Data Link.
Policy environments, organizational issues, and stakeholder perceptions vary.
Linking teachers to student outcomes can provide valuable feedback to improve professional practice and student learning.
However, an impeachable data link may cause more harm than good.
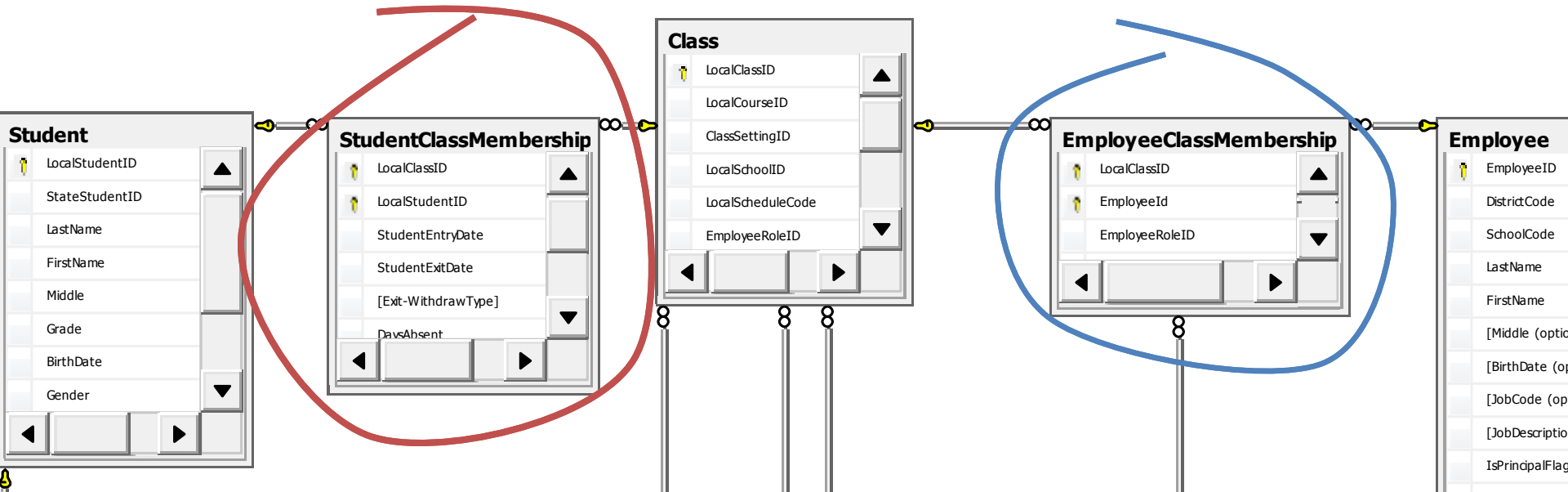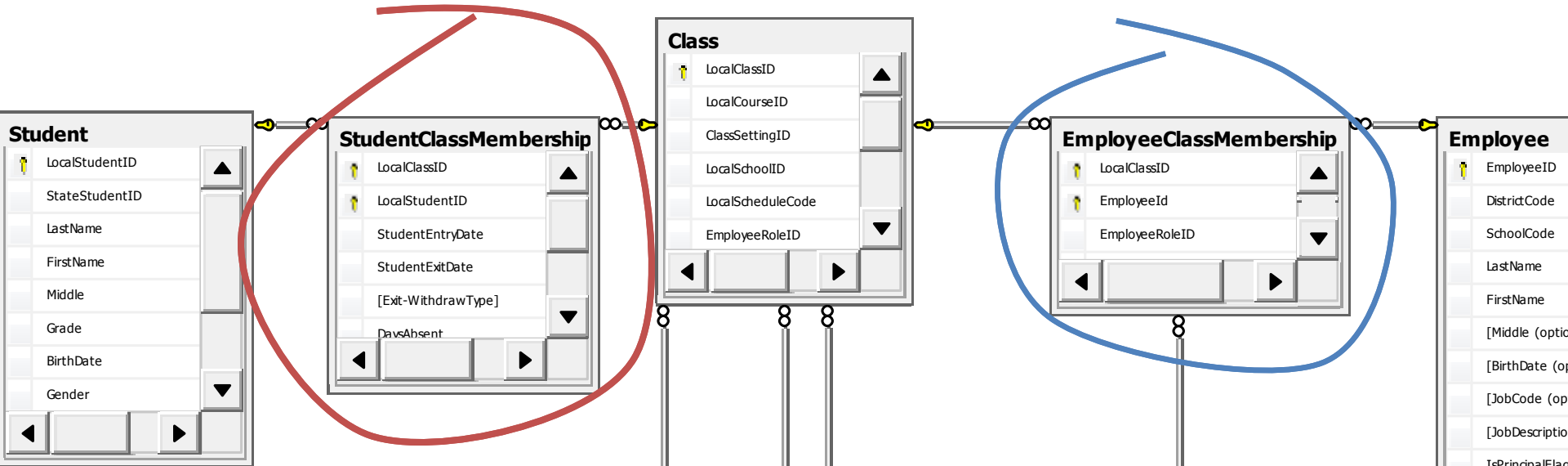
Accept and continue with the session

Cancel

Transactional/Operational Reference Model

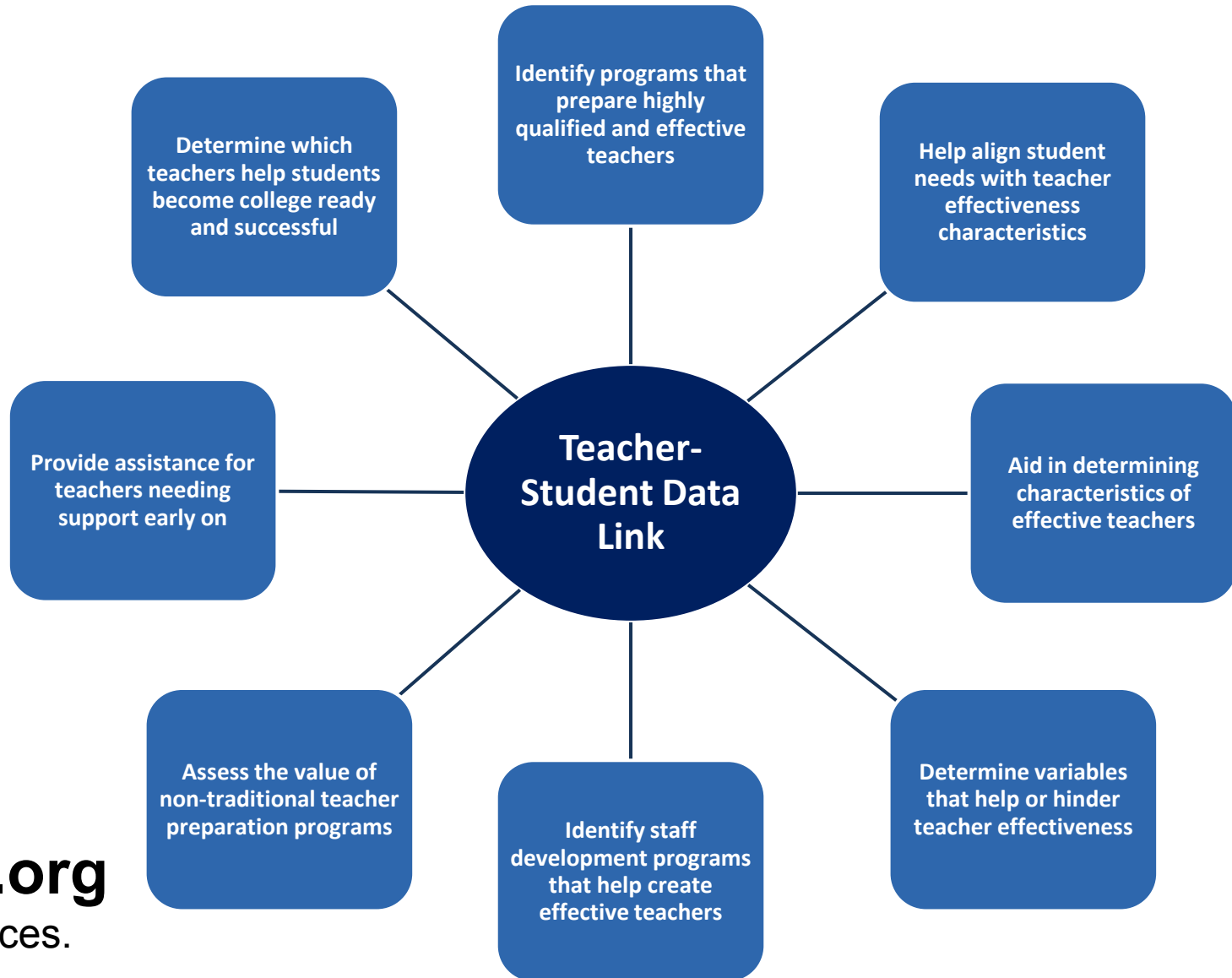# Transactional/Operational Reference Model

Transactional Reference Model

Student
- LocalStudentID
- StateStudentID
- LastName
- FirstName
- Middle
- Grade
- BirthDate
- Gender

StudentClassMembership
- LocalClassID
- LocalStudentID
- StudentEntryDate
- StudentExitDate
- [Exit-WithdrawType]
- DaysAbsent

Class
- LocalClassID
- LocalCourseID
- ClassSettingID
- LocalSchoolID
- LocalScheduleCode
- EmployeeRoleID

EmployeeClassMembership
- LocalClassID
- EmployeeId
- EmployeeRoleID

Employee
- EmployeeID
- DistrictCode
- SchoolCode
- LastName
- FirstName
- [Middle (optio...
- [BirthDate (op...
- [JobCode (op...
- [JobDescriptio...
- IsPrincipalFlag...

Rules (based on use)

Uses of the Teacher-Student Data Link

Teacher-Student Data Link

- Identify programs that prepare highly qualified and effective teachers
- Determine which teachers help students become college ready and successful
- Help align student needs with teacher effectiveness characteristics
- Provide assistance for teachers needing support early on
- Aid in determining characteristics of effective teachers
- Assess the value of non-traditional teacher preparation programs
- Identify staff development programs that help create effective teachers
- Determine variables that help or hinder teacher effectiveness

See
TSDL.org
for resources.

Teacher of Record Framework

Sample Definitions:

A __Teacher of Record__ is an educator (or educators in co-teaching assignments) who has been assigned the lead responsibility for a student's learning in a subject/course section with aligned performance measures.

A __Contributing Professional__ is an individual who has been assigned the responsibility to provide additional services that support and increase a student's learning.

See **TSDL.org** for resources.

Transactional/Operational Reference Model
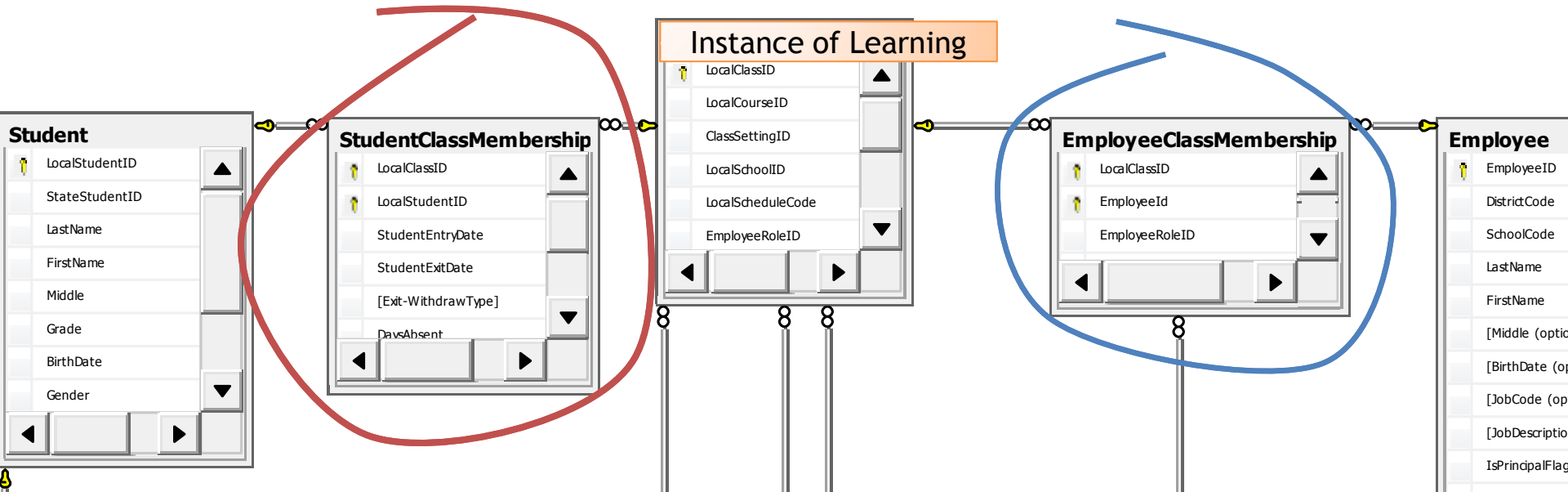
"Instance of Learning"
e.g.
• Pull-out instruction
• Project-based learning
• Mastery learning

Transactional/Operational Reference Model

Transactional/Operational Reference Model
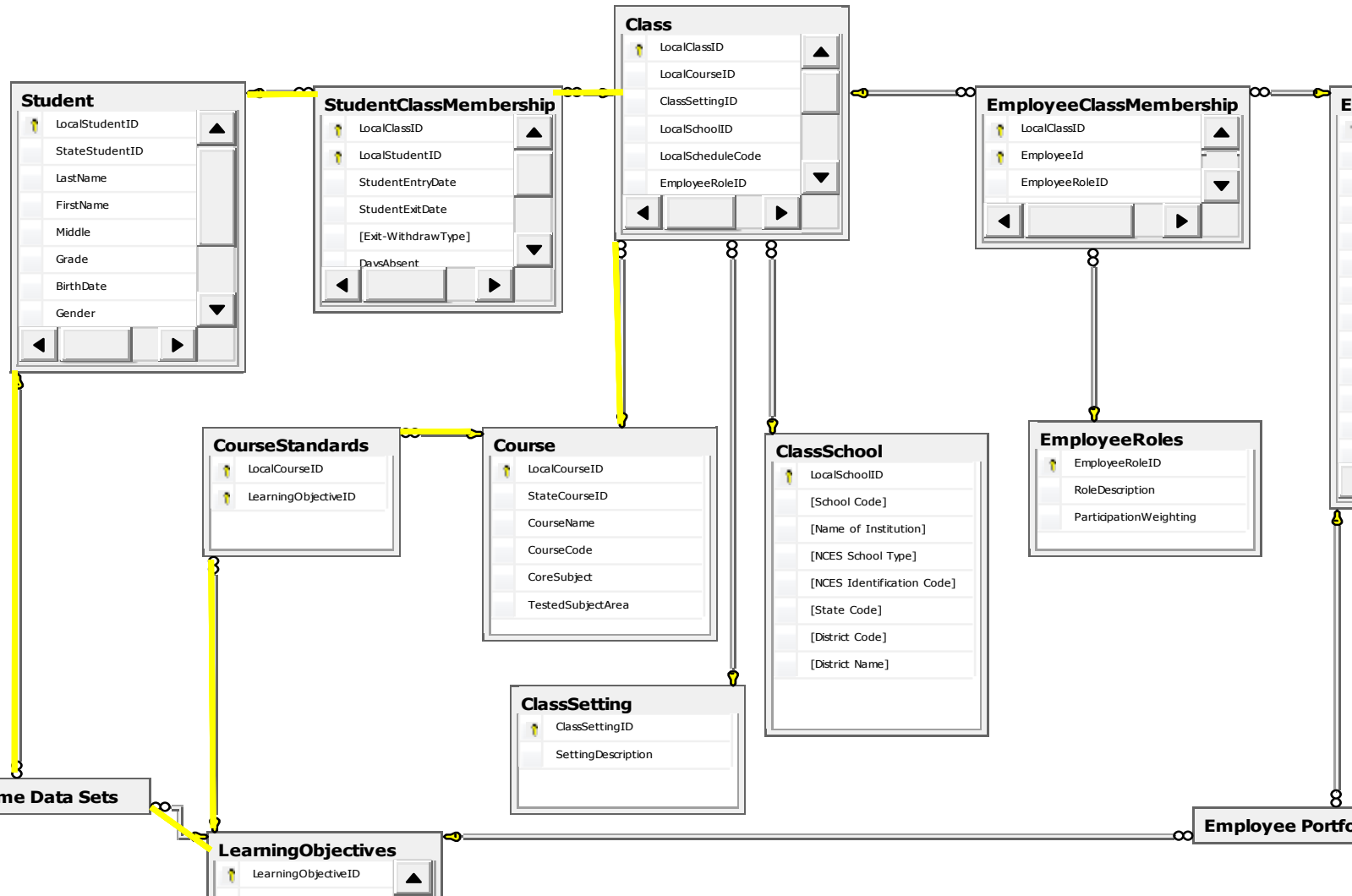
Transactional/Operational Reference Model
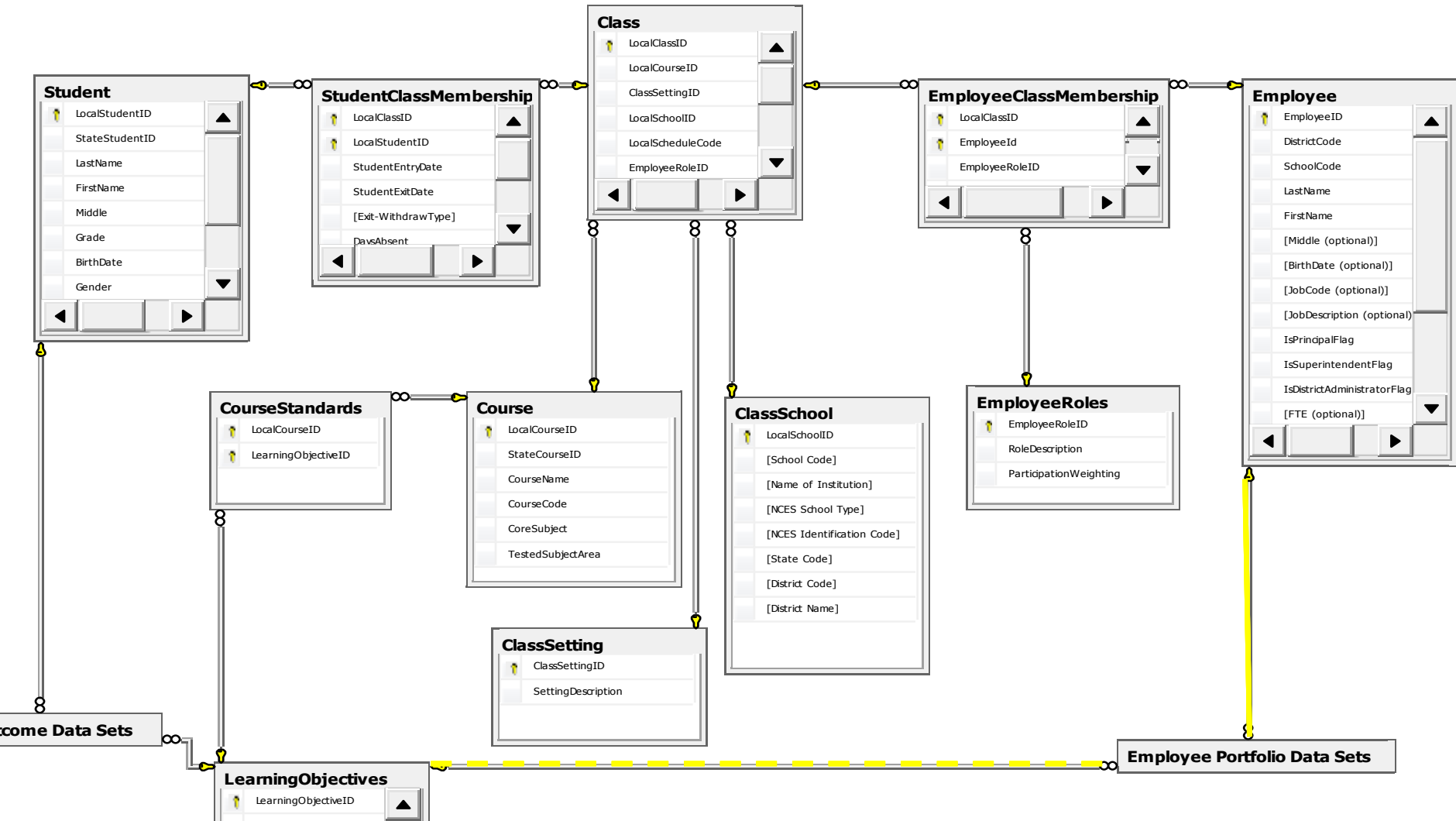
Interoperability Model -- CEDS State Core

Interoperability Model -- CEDS State Core

Class (Course-Section) is an
instance of an Organization

Organization
	Name
🔑	OrganizationId
	RefOrganizationId
	IdentifierGlobal

OrganizationPerson
	OrganizationId
🔑	OrganizationPersonId
	EntryDate
	ExitDate
	PersonId
	RefOrganizationPersonId

Person
🔑	PersonId
	IdentifierGlobal
	RefPersonId

Student
or
Staff

K12Section

Interoperability Model -- CEDS State Core

Class (Course-Section) is an
instance of an Organization

Organization
- Name
- OrganizationId
- RefOrganizationId
- IdentifierGlobal

OrganizationPerson
- OrganizationId
- OrganizationPersonId
- EntryDate
- ExitDate
- PersonId
- RefOrganizationPersonId

Person
- PersonId
- IdentifierGlobal
- RefPersonId

K12Staff
- TotalYearsTeaching
- PersonId

K12Section
- LocalId
- Description
- MediumOfInstruction
- SummerSchool
- Override
- CourseSectionCode
- SectionCode
- CountForAttendance
- RefCourseId
- OrganizationId
- Instruction_RefLanguageId
- RefNcesSettingId
- SecondarySubjectArea

K12EnrollmentSection
- RefExitReasonId
- NumberOfDaysAbsent
- NumberOfDaysInAttendance
- OrganizationPersonId

K12StaffSection
- OrganizationPersonId
- RefSectionRoleId
- ParticipationWeighting
- DaysAbsent
- DaysInAttendance
- HighlyQualified

PersonName
- PersonId
- FirstName
- LastName
- MiddleName
- GenerationCode
- OtherName

K12

RefExitReason
- RefExitReasonId
- ExitReason
- RefJurisdictionId

K12StaffAssignment
- FullTimeEquivalency
- AgeGroupTaught
- Migrant_RefStaffCategoryId
- RefAssignmentProgramId
- RefTeachingFieldId

PersonIdentifier
- PersonIdentifierId
- Identifier
- RefIdentifierId
- PersonId

RefNcesSetting

OrganizationPersonEvent

Dimensional Model (Class Enrollment Fact)

Why?

Dimensional Model   vs.   Normalized

Dimensional Model (Student Class Enrollment Fact)

Student Participation
Student Class Enrollment
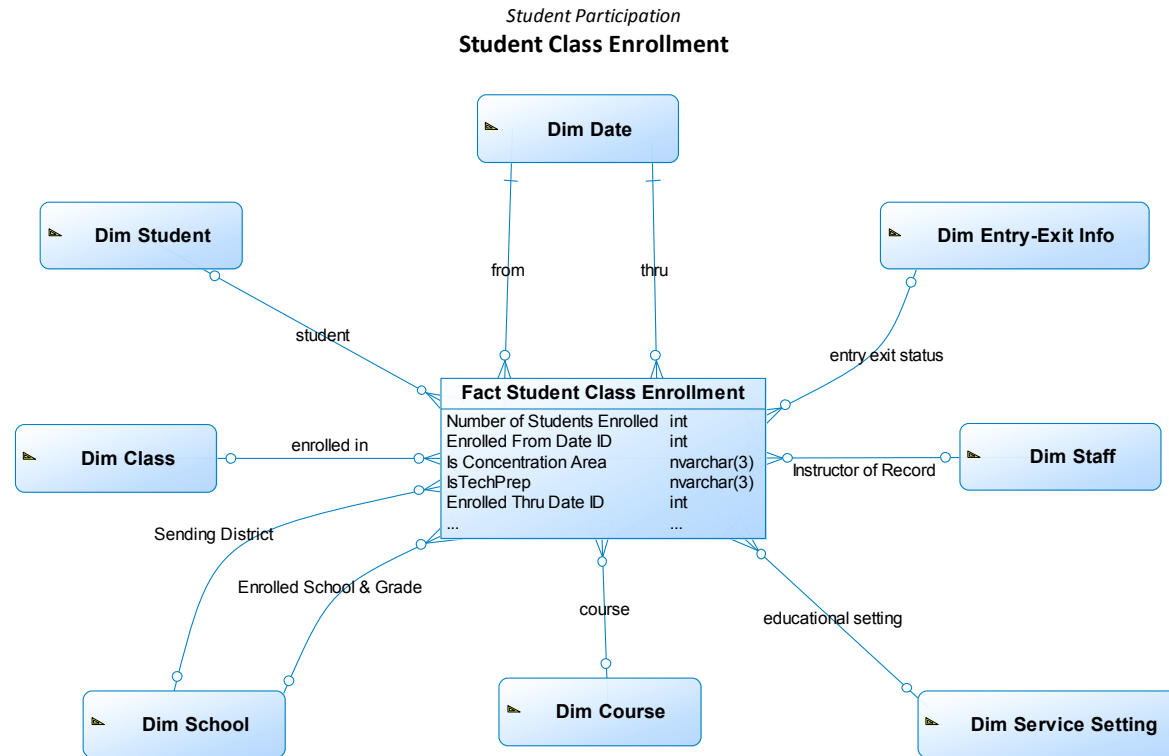
This example comes from NH's open Ed.DW model, for more information:
http://sites.google.com/site/EducationDataWarehouse

Star Schema to Support Uses of TSDL

e.g. Attributable Student Growth

(grain: student growth attributable to teacher-of-record or contributing educator)
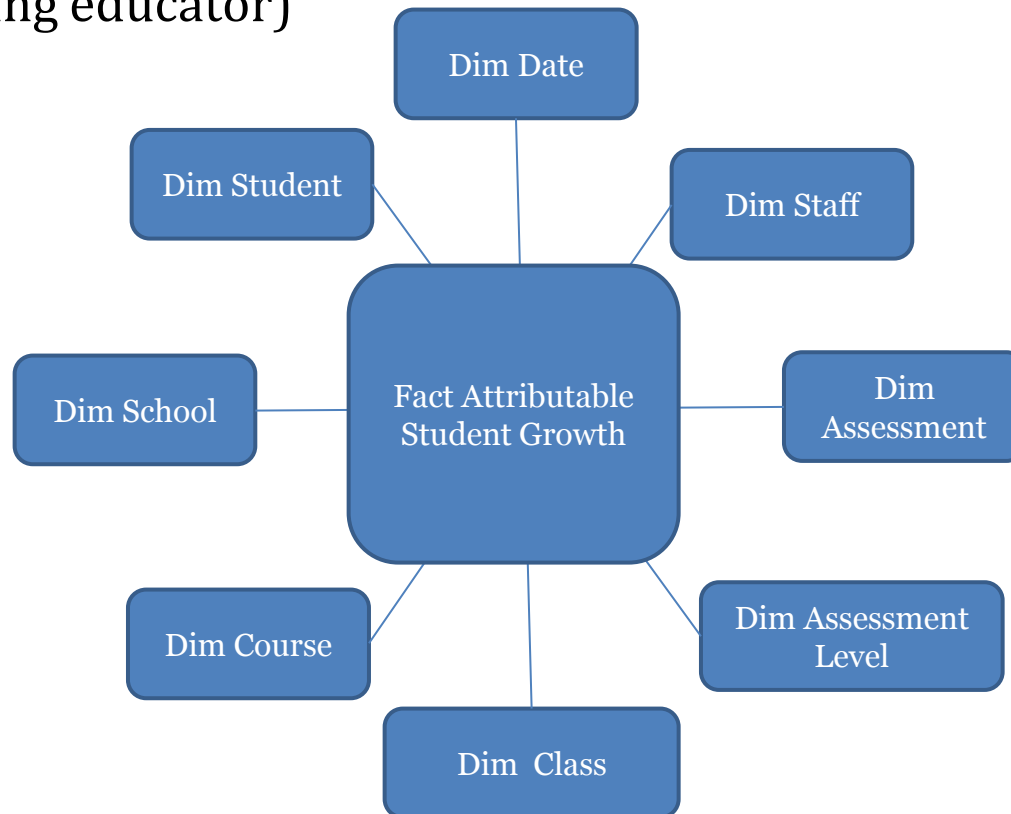
Data Quality (and trust)

Teacher-Student Data Link is about more than data.

Ten Key Components for Teacher-Student Data Link and Processes

Ten Key Components for TSDL and Processes

TSDL Component	Process	SEA	LEA	School
1. Managing Schedules and Courses	❖ Manage State Common Course Catalog	X		
	❖ Manage Course Catalog		X	
	❖ Create and Maintain Student and Class Schedules			X
2. Uniquely Identifying Educators and Managing Profiles	❖ Certify Educators ❖ Issue Unique State Educator IDs	X		
	❖ Track Educator Certification and Highly Qualified Status ❖ Manage Unique State Educator IDs		X	
	❖ Manage Educator Profiles			X
3. Uniquely Identifying Students and Managing Student Profiles and Enrollment Data	❖ Issue Unique State Student IDs	X		
	❖ Manage Unique State Student IDs		X	
	❖ Manage Student Profiles ❖ Enroll and Discharge Students			X

Ten Key Components for TSDL and Processes (continued)

TSDL Component	Process	SEA	LEA	School
4. Tracking Daily Attendance / Membership for Teachers and Students	❖ Manage Average Daily Attendance and/or Membership	X	X	
	❖ Track Teacher and Student Attendance			X
5. Recording and Reporting Grades and Transcripts	❖ Link Transcripts to Higher Education	X		
	❖ Manage Transcripts		X	
	❖ Track grades and Issue Report Cards			X
6. Managing Assessments and Outcome Data	❖ Administer Assessments	X		X
	❖ Link Student Learning and Outcome Data Manage Local Assessments		X	
7. Managing Data Linkages and Flow	❖ Manage Data Flow between SEA – LEA – School	X	X	X

Ten Key Components for TSDL and Processes (continued)

TSDL Component	Process	SEA	LEA	School
8. Strengthening Data Governance and Management	❖ Data Governance	X	X	
	❖ Continuous validate teacher-student data link.			X
9. Using Teacher-Student Link within the Organization	❖ Continuous SEA Service Improvement Planning and Evaluation process tied to TSDL data.	X		
	❖ Continuous District Improvement Planning and Evaluation process tied to TSDL data.		X	
	❖ Continuous School Improvement Planning and Evaluation process tied to TSDL data.			X
10. Cross-Agency Linkages	❖ Linking Data Across Agencies e.g. State Agencies, Community Services Agencies	X	X	X

Roster Verification/Certification

...for unimpeachable confidence in the data link.

Warnings about Roster Verification

- Rigor and frequency of RV process must take into account:
  1. Intended uses of the teacher-student link
  2. Quality of data in source systems
  3. Policy environment

Warnings about Roster Verification

- Not about the technology "tool"
- Not one-size-fits-all

Warnings about Roster Verification

…well defined specific process to address:

1. Intended uses of the teacher-student link
   - higher stakes uses = more rigorous process
2. Quality of data in source systems
   - accurate, complete, granular, longitudinal, auditable, trusted
3. Policy environment

…and a number of other factors of "capability maturity" .

Arkansas' Active Course Rosters

http://www.arkansased.org

ADE Teacher Student Data Link (TSDL) Reporting Data Model

❑ Data Model is fully dimensional in nature which helps to slice and dice the data across various school years

❑ Data Model comprises of Facts and Dimensions related to

- ➢ Teacher
- ➢ Student
- ➢ Course
- ➢ Assessments (In Development)

❑ Data model conforms to the basic definition of data warehousing – integration of subject oriented data marts through dimensional conformity

ADE Teacher Student Data Link (TSDL) Reporting Data Model – Crosstab View

Dimensions	LEA	School Year	Cycle	Student	Course	Staff
Enrollment Fact	X	X	X	X		
Register Fact	X	X	X	X	X	
Class Schedule Fact	X	X	X		X	X
Job Assignment Fact	X	X	X			X

❏ Summarized Facts & Dimensions Table for TSDL Data Model

Dimensional Conformity in TSDL Reporting Data Model: Student & Course
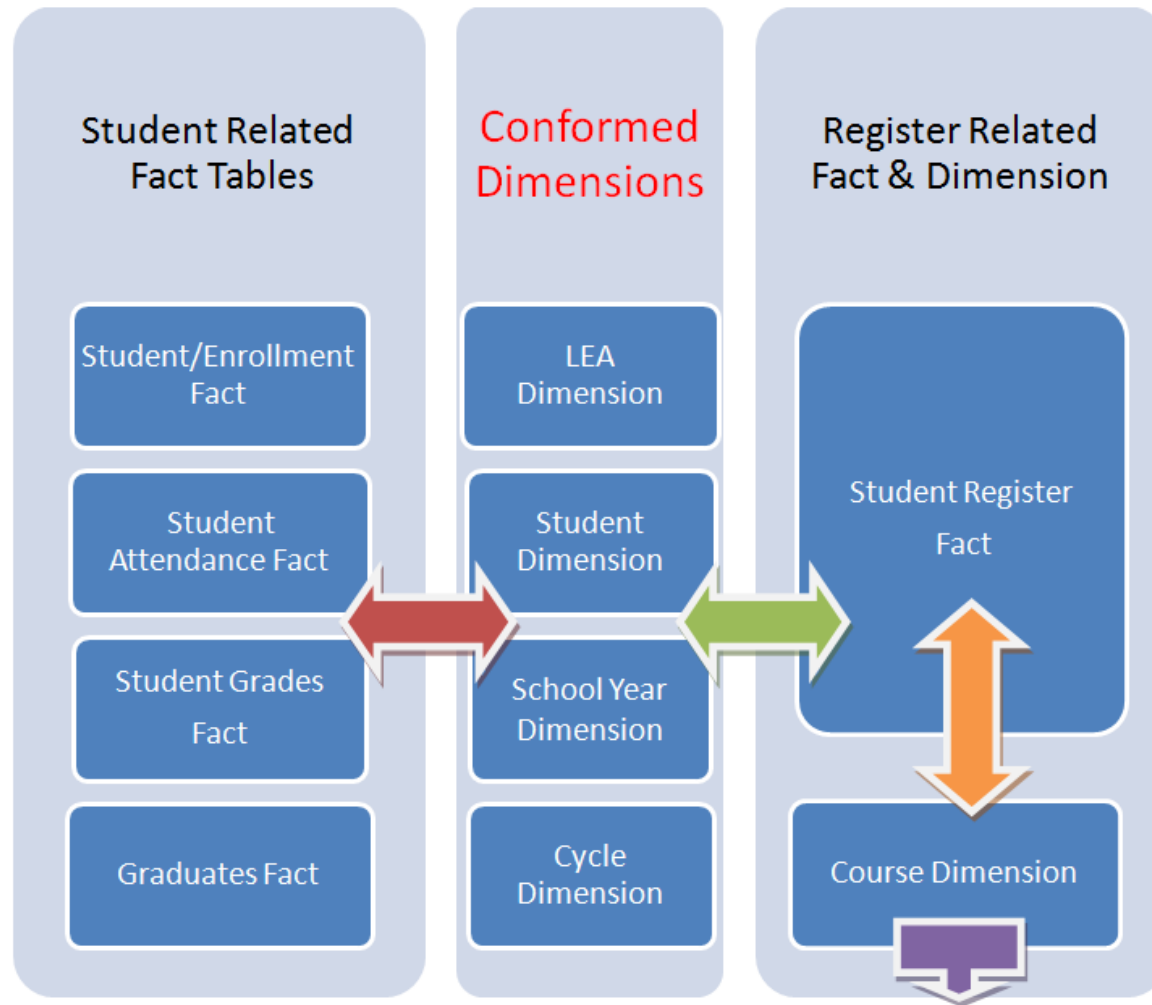
Dimensional Conformity in TSDL Reporting Data Model: Teacher & Course
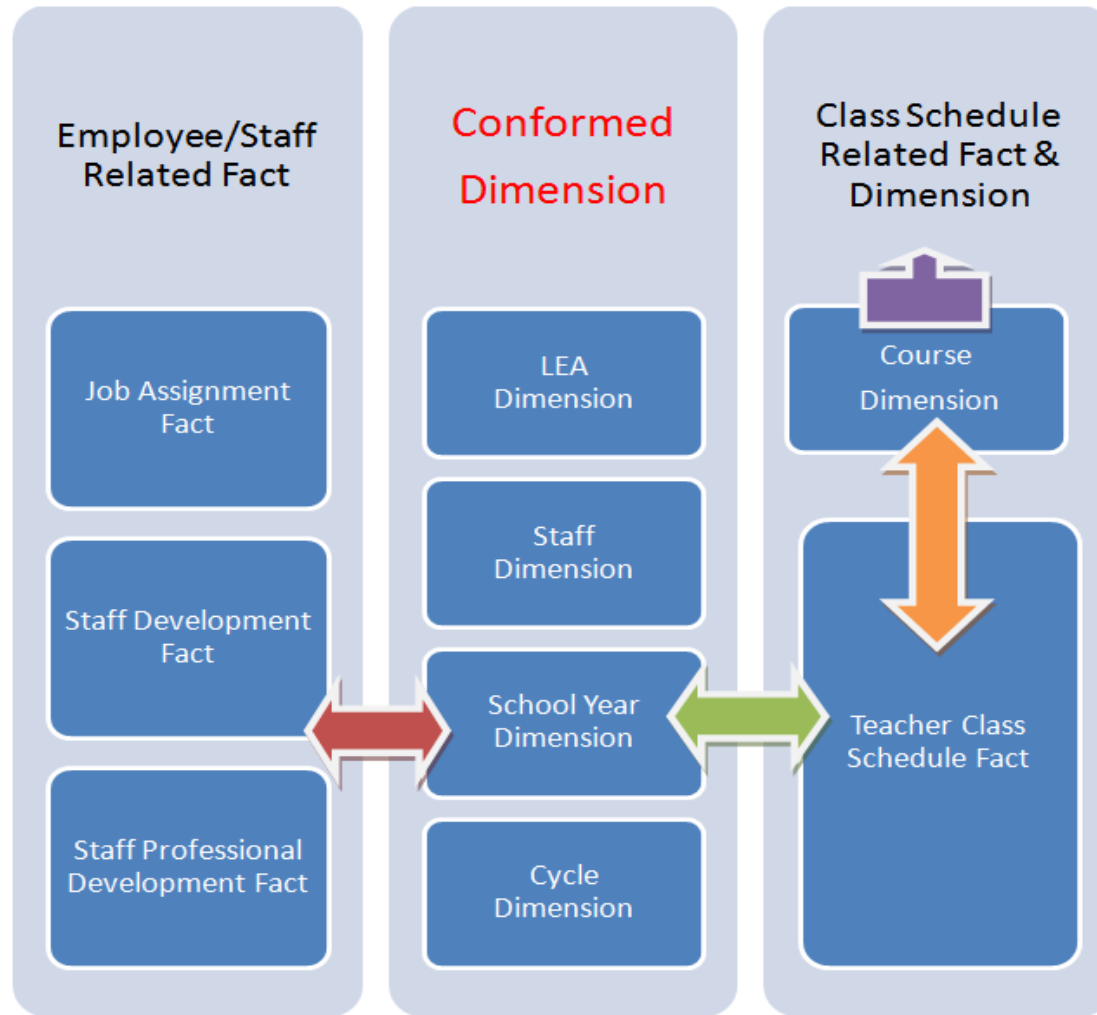
ADE TSDL Reporting Data Model Diagram
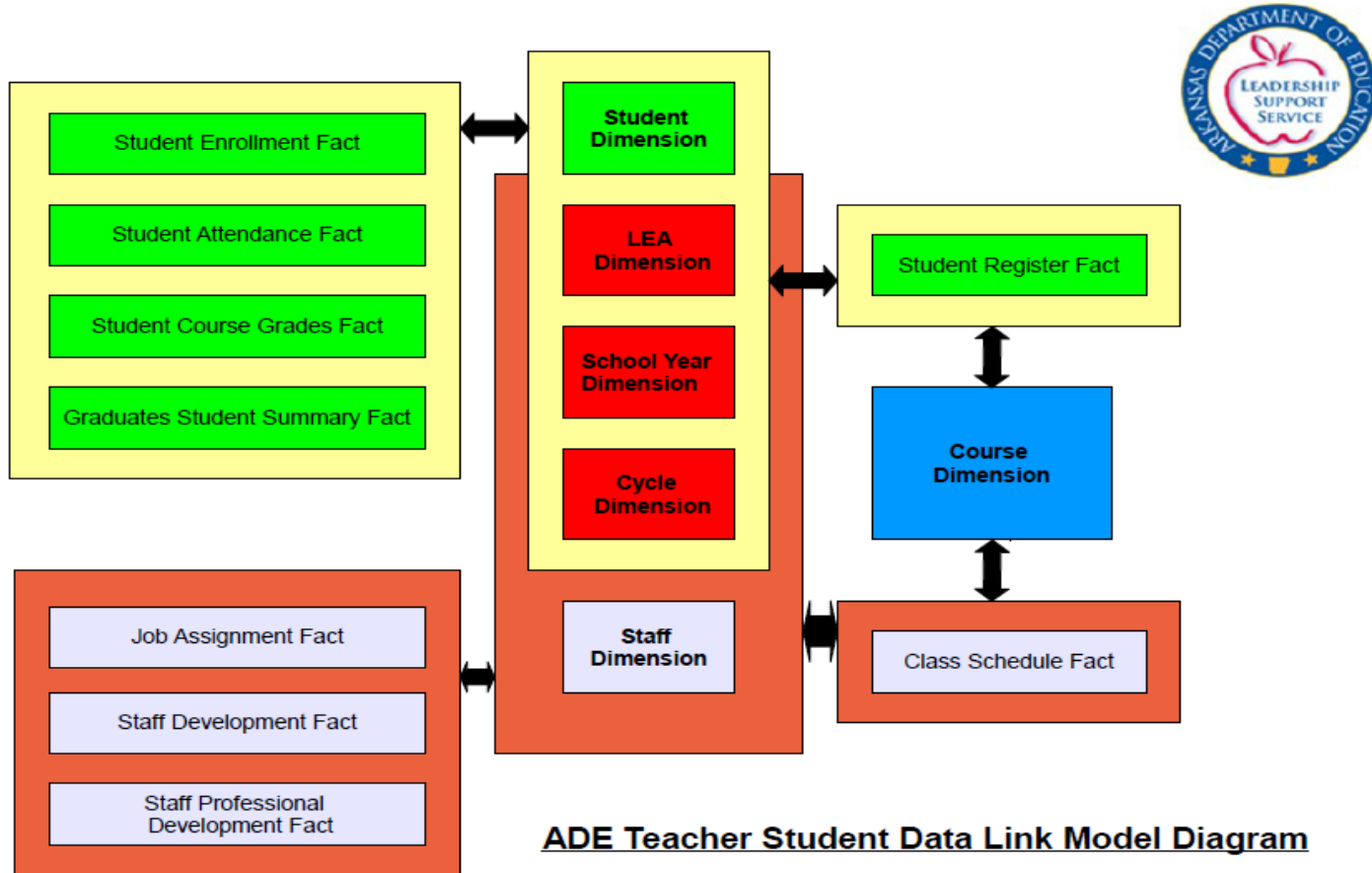
ADE Teacher Student Data Link Model Diagram

Sample Student Assessment Fact
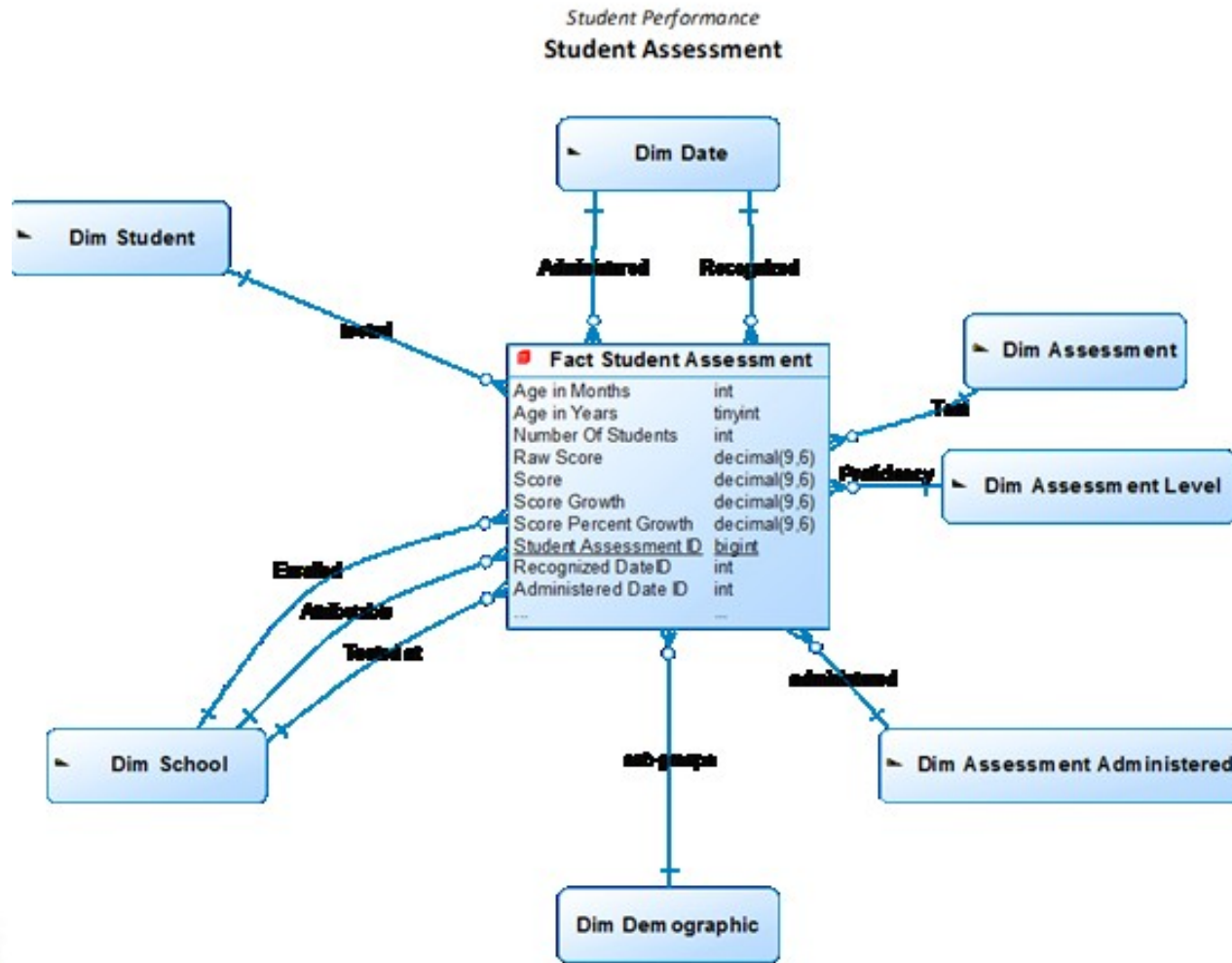
Operational Data Model (Simple)

Schema has been generalized to protect vendor's intellectual property.
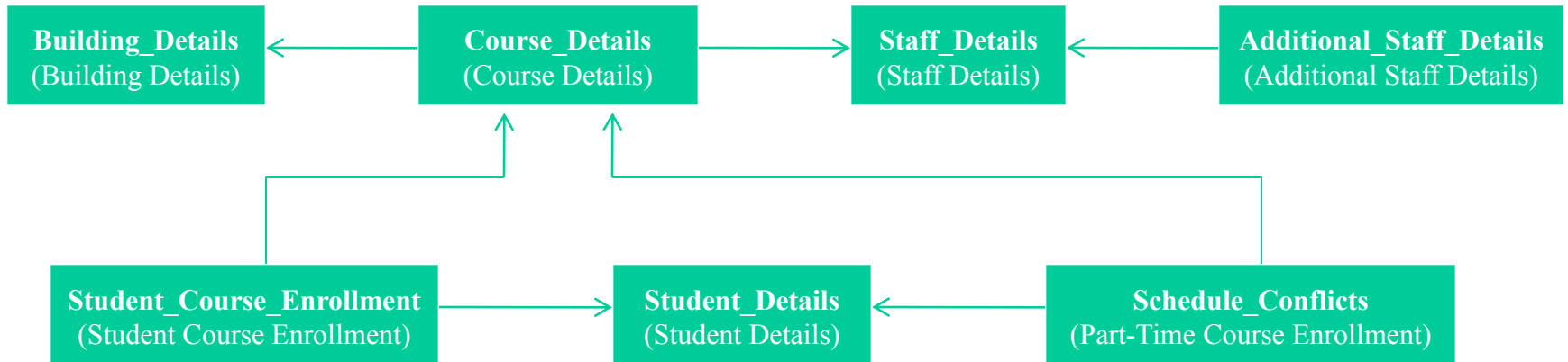
Operational Data Model (Detailed)

Building_Details

district_lea
building_id
building_lea
building_name

Course_Details

district_lea
building_id
course_code
course_section
course_session
course_description
staff_id

Staff_Details

district_lea
staff_id
first_name
middle_name
last_name
ssn

Additional_Staff_Details

district_lea
staff_id
state_id

Student_Course_Enrollment

district_lea
student_id
building_id
course_code
course_section
course_session

Student_Details

district_lea
student_id
state_id
first_name
middle_name
last_name
ssn

Schedule_Conflicts

district_lea
student_id
building_id
course_code
course_section
course_session

Schema has been generalized to protect vendor's intellectual property.

38

Website

Permission Levels

Teacher

Principal

Superintendent

State Department Staff

Verification
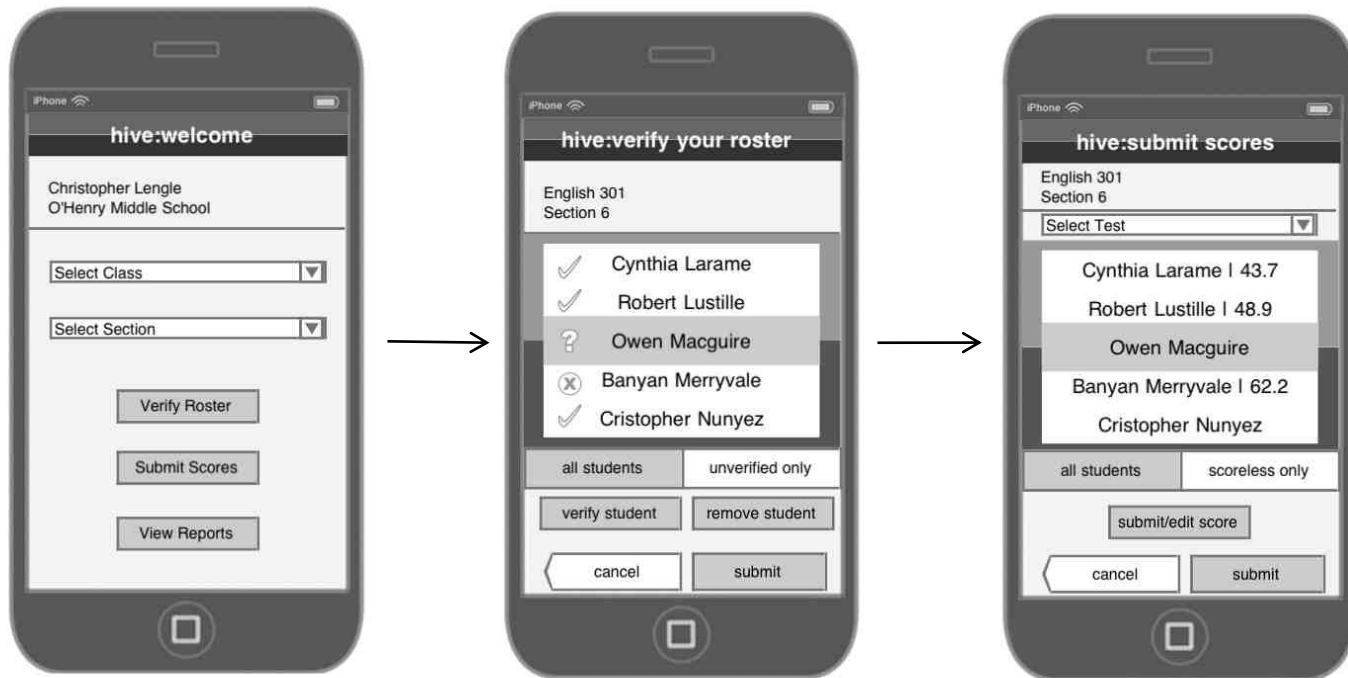
Reporting Errors

Verified Snapshots

Next Steps

- Further Integration into SLDS Reporting Model
- Professional Development/Training
- TSDL Policy Development
- Appeals Process

What Else Arkansas is Doing for a Quality Teacher-Student Data Link

- Roster Verification as Part of Classroom Assessments Upload Process (web or mobile device application)

What Else Arkansas is Doing for a Quality Teacher-Student Data Link

- Roster Verification linked to Educator Use of Data
Cognos Reporting, "Quick Looks", Hive Data Visualization
(Giving Something Back)

See Also…
The Student Growth Paradox
Neal Gibson
Concurrent Session XI
8:30 - 9:30 Friday

Summary of Roster Verification
(not necessarily either-or)

Event Based	Embedded Process
"Certifying" Data	"Verifying Data"
For a Specific Purpose	For Multiple Purposes
Once a Year (or collection cycle)	Frequently (Daily Grain)
Called out as separate Process	Embedded within daily tasks
Longitudinal changes may be collected as part of the process	Longitudinal history collected via nightly snapshots
Purpose: fulfills compliance/policy, establishes trust in the TSDL	Purpose: improves data quality at the source, establishes trust in the TSDL
Supports an appeals process	Uses of TSDL help drive adoption and data quality

Key Points for TSDL Data Model
(not necessarily either-or)

1. Different structures for OLTP, OLAP, other
2. High stakes uses require more granular longitudinal data captured, verified, and certified
3. Design must support policy and practice

- Proceed with caution: An impeachable data link may cause more harm than good.

Contacts:

- Cody Decker (ADE) - Cody.Decker@arkansas.gov
- Jim Goodell - jgoodell@celtcorp.com
- Laura Sonn - lsonn@dataqualitycampaign.org

- This presentation will be posted to:
  http://www.TSDL.org